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ELECTRICAL WORLD

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FEBRUARY 2
1935

The fundamental question facing us is whether the government shall remain a referee or become a player in the game of business. Some, like Mr. Lilienthal, believe the referee should pick up the ball and run with it himself.

JAMES P. WARBURG
President the Economic Club of New York

No duty has ever come in my life, even that in the service of my country, which has so appealed to my sense of social obligation, patriotism and love of mankind as this, my obligation to say and do what I can for the preservation of public utilities privately owned.

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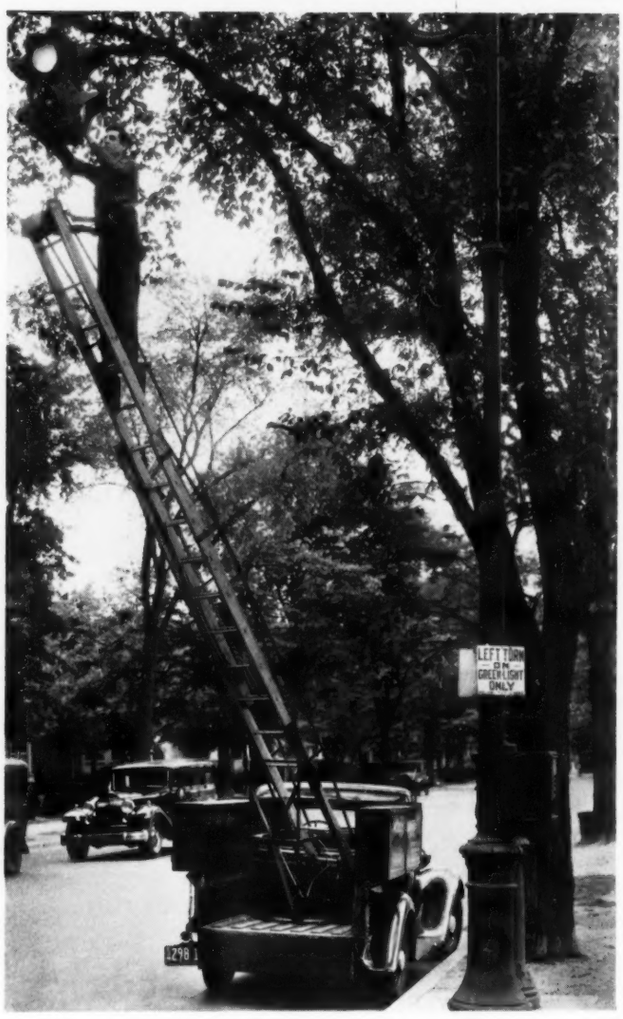

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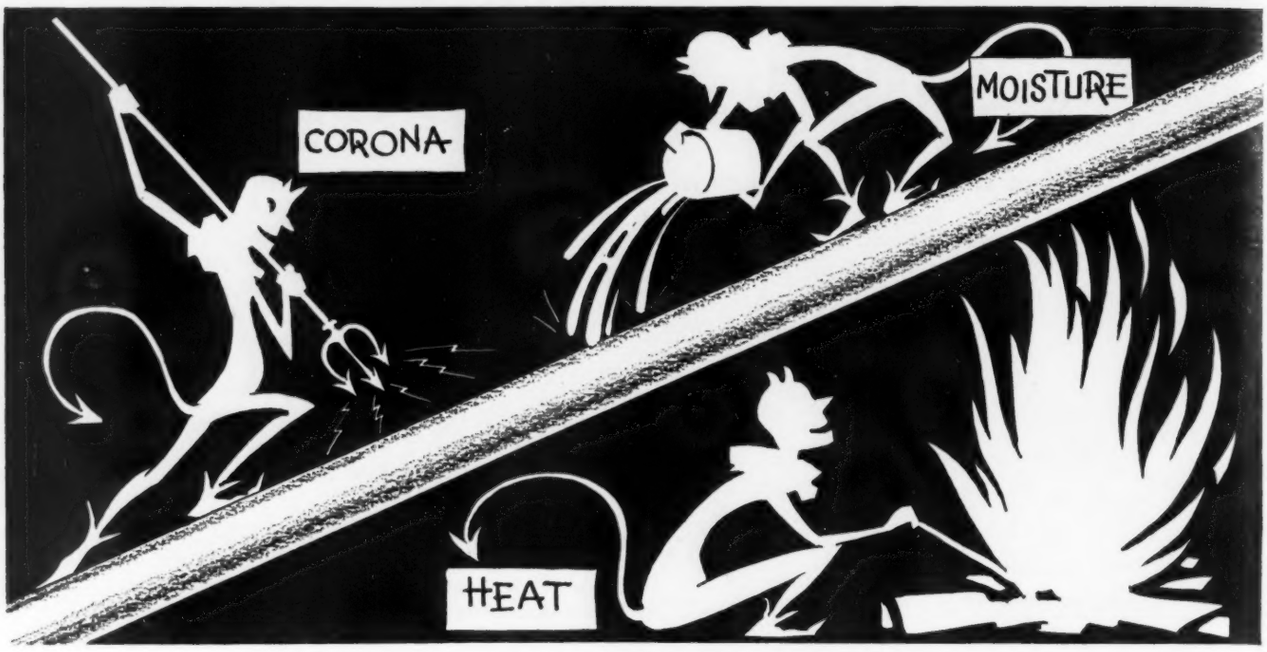

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As Gleaned From This Issue of "Electrical World"

▸▸A.I.E.E. Tackles Problems

Solutions of overhead-line and cable problems, selection and application of electronic tubes in industry, reduction of noise from electrical equipment, new developments in illumination, welding, and communication, losses in induction motors, requirements of technical education were topics discussed at the A.I.E.E. winter convention this week. While all of the 52 papers were circulated among the entire membership in advance of the convention, the subsequent discussion of these papers is equally interesting. In this issue we have attempted to summarize the most significant comments so our readers can benefit by their immediate application to problems in hand.

▸▸Private or Purchased Power?

Both private generation of power and purchased power have a place in industry as a whole, although the first source is often chosen when it has no economic justification. There should be no argument over which should be used if *all* the factors involved in each plan are carefully considered and weighed. It is the indifference to sound accounting principles, or lack of knowledge thereof, that has led so many industrials astray in their decisions. Even those industries which have waste heat available or which have large needs for process steam are not always justified in generating all their power, as evidenced by the fact that many purchase more than they generate. Considering just one group—the brewing industry—Gilbert Wilkes, consulting engineer, presents in this issue some observations from his experience with pre-prohibition and prohibition breweries. The principles involved in the decisions should be of value to utilities, industrials, consultants and equipment manufacturers.

▸▸Most Precious Asset

Seemingly, the most precious possession of utilities—public good will—has flown out the window to be captured by public-ownership advocates. How are we to win it back? That is a question the president of the Puget Sound company has been asked to answer in this issue, because he was engaged to rectify this situation for his company. He offers no magic formula, but some sterling principles fundamental to the solution.

▸▸Electronics in Power

Electron tubes—glass and metal, vacuum and gas—have found many jobs on power systems. But they have not moved as fast and as far as was predicted for them. The jargon of the radio engineer was foreign to the language of the power engineer and it has taken time to overcome that obstacle. However, one system has made much progress with electronic devices. Its experience is told to prove that it has found uses for such devices and sees many more applications ahead. That holds for tubes that handle small currents like their radio progenitors or large ones like their immediate rectifier ancestors.

▸▸Unemployment Reserves

Judging from the extent to which various state legislatures have taken up jobless relief, and President Roosevelt's announced program, business and industrial organizations are going to be forced to shoulder more of the financial burden in the future. Whether they like it or not, utilities will be included with other businesses. If business executives can devise some financially sound plans which protect employees from unemployment during depressions and old age, there is less likelihood of having unsound procedures crammed down their throats. Henry C. Hasbrouck, who discussed the subject last fall before New York State utility executives, was asked to present his viewpoints on it in this issue.

▸▸Recovery—How Fast?

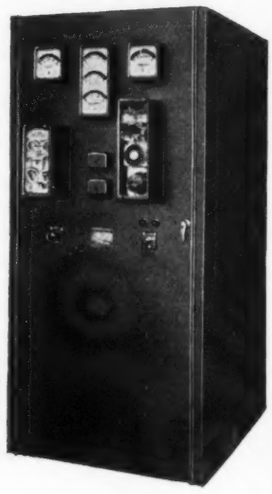
Periodic reports on energy output are not "just figures." They answer questions, indicate trends. Lately they have been saying, "Look ahead. Loads are piling up. Records are breaking." What next? How far has recovery progressed? How fast are we going? Where is improvement strongest? In this issue the latest available data on utilities' revenue appear. Energy sales are analyzed by geographical regions and classes of users. Sales of equipment to utilities and users of their services and activity in the contracting field are intimately connected with trends in utility revenue. Activity in the utility field is an excellent barometer of business in general. Watch the bi-monthly reports in ELECTRICAL WORLD on various conditions.

Coming Issues

Among topics which will be discussed by authorities in future issues will be: Use of electron tubes in power systems, meter trends, rural aid to recovery, and fixing transmission counterpoise lengths.

Have You Considered the Money-saving Advantages of Metal-enclosed Switchgear?

Here They Are:



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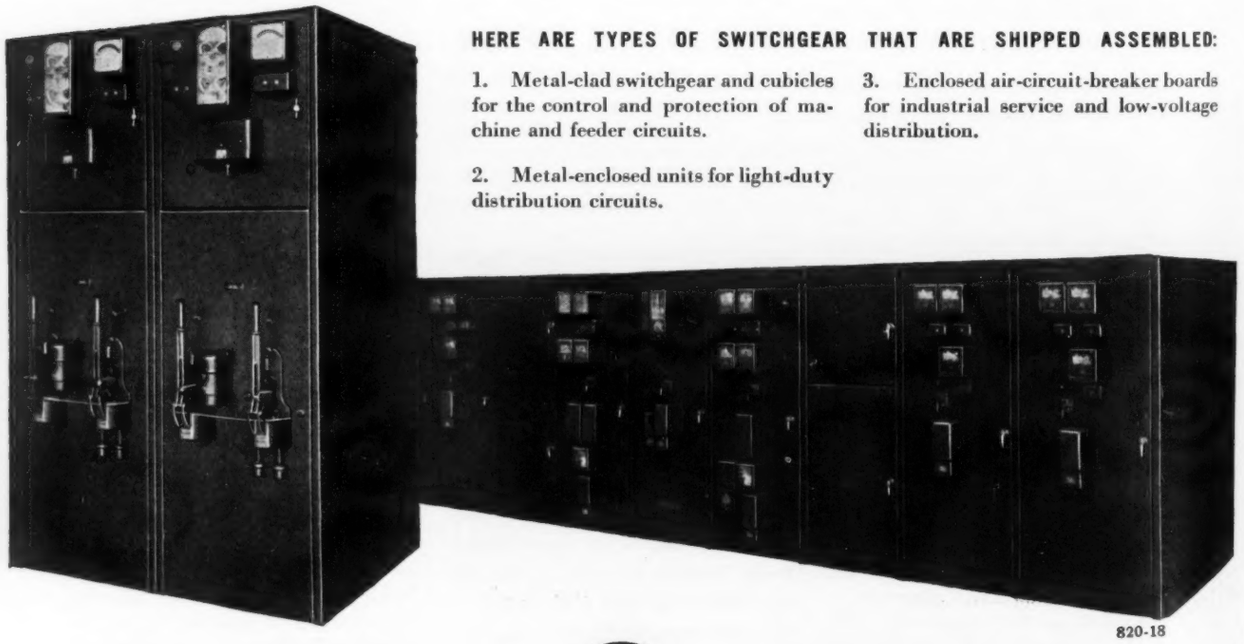
Our specialists will be glad to send you additional information, or to discuss this equipment with you and make recommendations for your plant or station. General Electric, Schenectady, N. Y.



HERE ARE TYPES OF SWITCHGEAR THAT ARE SHIPPED ASSEMBLED:

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2. Metal-enclosed units for light-duty distribution circuits.
3. Enclosed air-circuit-breaker boards for industrial service and low-voltage distribution.

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FEBRUARY 2, 1935

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A United Front for Business

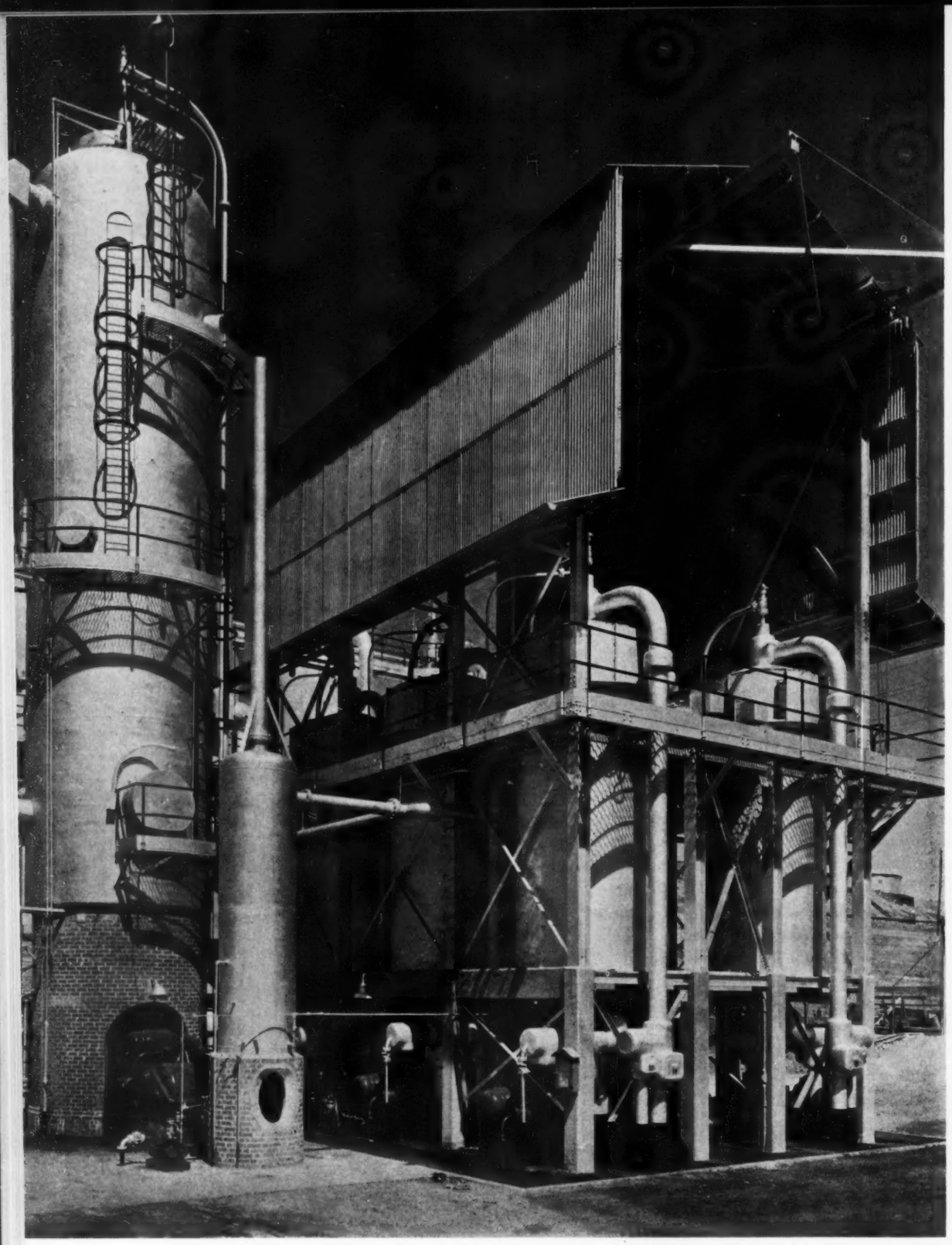
HEADS are up in the electrical industry. There is a clear realization that the political attacks on the utilities have crystallized into the old question of public versus private ownership. This has been settled favorably before, and will be again when the public examines the facts. The new political approach to the utility business is bringing about its own downfall and the facts about these political projects carry their own prophecy. The industry at last is turning its attention to markets instead of to Washington and many plans for aggressive action are in process of formulation.

A glance at sales results this past year shows some great achievements and attests the soundness of plans to go after more sales with a united industry front. Market expansion is the road to industry prosperity and can be made the spearhead for general national recovery. The farm, the home, the factory and all other markets are ready and receptive to sales. The government, as well as the industry, is promoting the idea of more electrification. The industry, however, with the co-ordinated and organized effort of all branches and all individual enterprises, is the agency to bring this about rapidly and also economically.

There is no vital economic significance in grandiose plans for building uneconomical hydro projects, for constructing long transmission lines or for dreams of carrying rural lines to all farmers without consideration of their incomes or the costs involved. These are political projects that cost the taxpayers money, but they are not fundamental nor can they prevent industry progress under private initiative. The only real problem is to sell more service and more equipment to existing customers from existing stations and lines; of making a buyers' market for electrification. Business chances must be hazarded in prices and expenses if full benefits of any sales program are to be had. This is the road to low rates, low-priced appliances, public approval, increased volume of business and increased profits.

RECAPITULATION of the sales accomplishments in some territories during the past year shows what may be done. An added increment of 200 kw.-hr. to the average domestic customer use is a beacon that has been lighted by one or two utilities in this class of business. Large increments in industrial power and heating load in some areas shows what can be done in all. The Better-Light campaign has opened up new levels for lighting accomplishment. Intelligently applied sales programs can cut the "loss customers" in the domestic class 15 to 30 per cent in one year. These straws of accomplishment show what might be done and will be done when the industry goes to work in the marketplace on a national scale and with a co-ordinated plan developed and applied by a united effort. This is a psychological moment to get prosperity through action.

This industry is sound. It has weathered the depression better than any other industry. It has opportunities for expansion unequaled by any other industry. It has had vexations and trials that have had an exaggerated effect upon the morale of its leadership and it has been slow in seizing upon its opportunities as a consequence. But this stage is passing rapidly. The road to recovery and prosperity is being swept clear of the rocks and drifts accumulated in the storms of depression. Industry leaders have regained confidence in the public and in their industry and are going forward. With organization and a united front they cannot fail.



OUTDOOR MOTORS CUT REFINERY INVESTMENT

Union Oil Company at Oleum, Calif., saves outlay for building to house a new unit. Standard inclosed motors also reduce the explosion hazard. Operating reliability supported by underground distribution. Close supervision and centralized operations made possible by remote control.

Practicality Dominates A.I.E.E.

FOR SCOPE, FORESIGHT AND PRACTICALITY the A.I.E.E. convention, last week, has hardly been excelled by former programs, discussions and opportunities for intimate conferences of that organization. New developments and practices in transmission, better utilization of transformer capacity, application of electron tubes in industry, reducing noise from electrical equipment and requirements of engineering education represent just half of the topics covered by the twelve parallel sessions. But for interest evoked they were the dominant topics. Other subjects—electric machinery, communication, welding, cables and induction motors—were covered by as many sessions.

All of the 52 papers presented have already been distributed to A.I.E.E. members. But the major comments they aroused are made available here in condensed form as being the most significant reactions to the topics which attracted the most discussion, pro and con.

Transmission Innovations

RE-ENTRY of d.c. into the field of power delivery at a distance is merely awaiting a chance to prove itself economically and practically. As a matter of experimentation well beyond the laboratory stage it has already established its feasibility in technical performance at 15 kv. Expulsion protective gaps have pretty well established themselves as leading aids to draining strokes away from insulators. One item left just a bit in the air was the certainty that lightning strokes do become multiple to the extent of as many as 40 discharges in $\frac{6}{10}$ of a second, photographically evidenced in K. B. McEachron's paper.

Lively discussion was evoked by the paper of C. H. Willis (Princeton) and B. D. Bedford and F. R. Elder (General Electric) entitled "Constant Current D.C. Transmission." No claim was made that the rectifier-inverter scheme of Thyratrons and Steinmetz's monocyclic mesh was destined to supplant constant-potential a.c. transmission, but it was offered as something meriting service trial because a 3,000-kw. circuit has functioned successfully at 15 kv. in the Schenectady plant for several months.

D.c. scheme has merits

Limitations and promise of the innovation is well set out in the following words of C. W. Stone, long a prominent advocate of direct-current transmission:

> One outstanding feature is that for the first time in the transmission of electric power (except with the Thury system), full control of the amount of the power flow and its direction is obtained. As the system described is a non-synchronous tie, the inverter is always in phase with the system to which it is connected and the frequency of the system can be like or unlike that of the system feeding the rectifier. Major disturbances which take place on existing systems, such as short circuits which tend to pull the system apart, cannot take place if this system of transmission is used, as a short circuit causes a reduction of power flow over the circuit in trouble—the contrary of what exists in all customary systems.
>
> By the employing of the monocyclic network the circuit automatically adjusts itself to feed a load of any lagging power factor. Losses in the particular tubes used in the 150-kw. outfit described by the authors and in the larger tubes used in the 3,000-kw. outfit are so small that they can be neglected.
>
> It would appear that this system of transmission is particularly applicable to underground cable installations.

Except for large blocks and long distances direct-current transmission does not compete economically with alternating current in the opinion of R. E. Hellmund (Westinghouse). All-day efficiency is also likely to be low because losses are the same at light load as they are at full load because of the constant-current characteristic. Cost of converting apparatus would run high on systems with many terminals.

To Philip Sporn the circuit appears far less severe on tubes than almost any other offered in the power realm. The first opportunity for application appeared to him to be on double-circuit construction having only one existing circuit and with a single conductor run in the idle space to establish a grouping of three-wire direct-current circuits. He also pointed out that the electrical system would still be dominantly alternating current because of generation and utilization. Expulsion tubes have nearly solved lightning on alternating current lines, so raising direct-current voltage up to 50 per cent of flashover would contribute nothing in this direction. Anyhow corona formation will have to be studied afresh. None of these uncertainties detract, however, from the credit for a brilliant piece of development, even though it does not necessarily presage an era of revolutionized transmission.

Middle ground between doubting and lauding was also taken by H. W. Eales (Byllesby). He estimated the potentiality to be roughly double that of alternating current under comparable physical factors, but had misgivings about communication interference. The inherent virtue of positive power control may be more a detriment in system operation where paralleled lines or alternative routings are simultaneously involved in energy flow. Herman Halperin (Commonwealth Edison) mentioned that existing cable joints are too short on a leakage-creep basis for d.c./a.c. ratios of 2.5 or 3.0. Lengthened joints might mean lengthened manholes.

Expulsion gaps cope lightning

Possible attainment of a lightning-proof line at reasonable cost was what the Sporn-Gross paper, "Expulsion Protective Gaps on 132-Kv. Lines," meant to E. M. Hunter (General Electric). Shunting of surges harmlessly to earth is their function. Ability to interrupt short circuit and restore service in a minimum time of one cycle or less should reduce necessity of complicated relays and breakers and of duplicating circuits to insure service continuity. The cost of equipping existing lines will lie between that of a ground wire with counterpoise and of Petersen coils.

Attention was called by A. M. Opsahl (Westinghouse) to the article in the January 19 issue of ELECTRICAL WORLD which cited the efficacy of expulsion tubes on a horizontal circuit without ground wires. K. B. McEachron said further development should shortly confine flashover to the inside of the tubes even under the extreme rain conditions cited by Sporn and Gross. He went into considerable detail to show why the expulsion protective gaps on one of two circuits offers some protection to the other circuit up to a certain limit of current. This does not hold, of course, if it is the unprotected circuit which is struck.

Are lightning strokes multiple?

Prof. C. F. Harding (Purdue) queried whether the multiple strokes reported by McEachron's paper were not really surge reflections. He found it hard to reconcile multiple strokes with any accepted theory of origination of lightning. Is the phenomenon of the nature of a residual cloud charge or is it a series of independent charges and discharges? W. B. Buchanan (Ontario Hydro) raised the interesting question whether the phenomenon might not be elucidated by consideration of the counter-emf. of self-induction of the discharge path and its promotion of "side-slip." Erratic terrain should, on this hypothesis, tend to break up clouds and deter stroke multiplicity.

New shielding on 287-kv. line

For the Boulder Dam line a new type of insulator shielding arrangement was reported by J. T. Lusignan (Ohio Brass). It involves a "figure eight" at the line end of the string and simple strap horns at the ground end. These are shaped to avert cascading under 3-microsecond time-lag flashes. For dead-ends the conductor jumper provides shielding on the lower side of the string and the loop shield takes care of the upper side. The high-speed (six cycle) relaying and switching makes damage to insulators unlikely because the arcs will migrate little after being initiated at the shields.

Overload for Economy

MAGNITUDES and durations of recurrent and emergency overloads that can be carried by oil-immersed transformers and the effect such loads will have on the life of the units were covered in two papers presented. Recommended revisions and extensions of the A.I.E.E. transformer standards were presented for the transformer subcommittee. Still another paper at the transformer symposium, by P. L. Bellaschi and W. L. Teague (Westinghouse), correlated the strength-of-air values which have been obtained with various shape electrodes and showed the effects of rod-plate and sphere-plate electrodes when subjected to impulse and 60-cycle waves.

Discussion on overloading transformers was extensive, some attacking Mr. Nichols' paper and others concurring. L. Wetherill (General Electric) emphasized that insulation aging from short-time overloads occurs chiefly after the overload has been removed, citing an example in which the loss of life was forty times greater during cooling than during the overload. Change of resistance can't be neglected in calculating hot-spot temperatures. One case showed 29 degrees difference, and the actual temperature may be so high after a 30-minute 200 per cent load as seriously to impair the insulation.

W. H. Cooney (General Electric) questioned the dependability of aging as a sole basis for determining permissible overloads, saying that an insulation may become brittle, but if it preserves a separation where the oil can function, the original dielectric strength may still be preserved. Oxidation of the oil from prolonged high temperatures, however, may impair dielectric properties long before serious aging of insulation takes place, as a thin film of oil next to the windings may attain copper temperature during severe overloads. Other factors affecting life were mentioned, such as type of winding, vibration, type of overload. He favored the recommendations of Dann and Montsinger.

On the other hand, F. W. Gay (United Engineers & Constructors) commended Mr. Nichols' recommendations, saying: "From the operator's viewpoint it is the best method of calculating from load duration curves the increment of transformer life that is going to be used up by overloading. With such information, which has been used ten years, it is possible to determine whether to purchase additional capacity, install cooling devices or accept the loss of life." Very likely, he declared, nearly all specifications for large transformers will soon require manufacturers to submit data from which an annual hot-spot deviation curve can be predicted based on annual load cycle.

Philip Sporn (American Gas & Electric) considers Nichols' recommendations too conservative, as transformers which operate under static conditions should have greater life than other equipment giving an unequal balance of durability in system components. Answering a comment that operating transformers at higher temperatures would reduce efficiency, he suggested that efficiency has become a fetish, and that changes in investment and operating expenses be reconsidered to ascertain new basis of economic designs even if efficiency is sacrificed to get lower unit costs.

Deterioration of insulation is largely due to oxidation, claimed H. V. Putman (Westinghouse), and insulation in an inert-air transformer has been subjected to the extremely high copper temperature of 175 deg. for two days with no sign of deterioration. Other units of this type have shown no insulation deterioration after several years. He reported use of temperature-controlled transformer breakers that allow higher copper temperatures for short durations. "Cannot operators use committee recommendations as well as Mr. Nichols?" he questioned.

Overloading transformers permits little advantage when they feed underground cables which haven't proportionate short-time overload ratings, pointed out Herman Halperin (Commonwealth Edison). For example, in the case of some 100,000-kva., 66-kv. transmission the full-load summer ratings of the transformers and cables are 100,000 and 96,000, respectively, whereas the one-hour emergency ratings are 140,000 and 110,000, respectively. For one group of three-conductor, 12-kv. cable a two-hour emergency rating of 110 per cent full-load rating is allowed following full load, compared with 125 per cent for two-hour emergency rating. Cable movement, sheath stretching, void formation, and maximum copper temperature affect special ratings.

Permissible loads are more dependent on oil temperature than ambient temperature, declared L. C. Nichols, who warned against higher oil temper-

atures than 80 to 90 deg. Basil Lanphier (American Gas & Electric) urged that something must be done to reduce costs.

Mr. Nichols' basis for determining permissible overloads was carefully considered by the transformer committee, reported J. E. Clem, "but it was not felt to be either a safe or practical method to use in setting up standards." Many factors affect life—vibration, variation in quality of insulating materials, sludge, effect of temperature on dielectric strength.

New Industrials Tools

DEVOTION of two entire sessions to ten papers on the subject of electronic tubes and their application in industry indicates the practical importance which engineers place on these developments. Except for two papers—the Thyratron motor and the Ignitron inverter—the second session was devoted to such practical subjects as the ratings of industrial electronic tubes and industrial applications thereof. Every industrial engineer should find material of value in the published papers. High lights of discussion, which follow, indicate the reaction of the audience.

Wonderful things have been and can be accomplished with electron tubes in industry, but it is somewhat of a disappointment, despite extensive uses, to see the number of applications fall so far short of possibilities, remarked R. E. Hellmund (Westinghouse). Nothing could reduce the cost of tubes and consequently increase the extent of application more than limitation of the number of ratings. It would be cheaper for users to accept the next higher preferred rating above the specific rating they want than to insist on "special-order" tubes.

Tolerance on electronic tubes, reported C. Stansbury (Cutler Hammer) is only half that for electro-mechanical devices, and he believes that the tolerance for tubes should be brought into line with other devices.

Use of ambient temperatures as a basis for rating mercury-vapor tubes leads to confusion, declared G. H. Rockford (Bell Laboratories) because the degree of ventilation changes the ratio of this value to the condensed-mercury temperature—a more important value.

Supplementing the papers on applications. R. L. Goetzenberger (Minneapolis-Honeywell) remarked that processing industries now have very effective tools with which to solve production problems, including color matching, solution control, measurement of smoke and the temperature of still or moving hot bodies. He referred to some new applications of cold-cathode grid-glow tubes — (1) closing full-supply valves to furnaces if the combustible mixture fails to ignite and burn, (2) regulation of sewage level in tanks, (3) control of moisture when making paper.

Need of better factory electricians was voiced by Mr. Stansbury because many of them are now easily bewildered if anything goes wrong in electronic circuits because they haven't followed developments. With all the excellent unemployed electrical engineers available it should be simple for industrial managements to correct this, at least temporarily, he suggested.

Some of the practices related in the Gulliksen paper were questioned by Mr. Chambers (General Electric).

However, Mr. Gulliksen, in closing, replied: "Copper-oxide rectifiers are best for small currents; batteries are favored for control where close voltage regulation is required, and paired photo tubes can be used for register control even when changing from white to brown paper, as the compensation is easily adjusted." He also declared that factory electricians are greatly improving their knowledge of electronic application and that separate or integral tube-testing sets make it easy to locate any troubles that develop in electronic devices.

Thyratron motors and Ignitron inverters

Two very ingenious developments—the Thyratron motor and Ignitron inverters—depending on electronic action were presented in published papers. Mechanically, said R. W. Wieseman (General Electric), the Thyratron motor is almost the equivalent of two Y-connected slip-ring units connected electrically and mechanically on the same shaft. One

EDISON MEDALIST EULOGIZED

By E. W. RICE, JR.
Past-President A.I.E.E.

▶ Dr. WILLIS R. WHITNEY [recipient of the Edison Medal, January 23, 1935] is many times a doctor—Sc.D., Ph.D., LL.D.—a teacher, inventor, executive, member and past-president of many scientific societies, trustee of institutions of learning and a notable chemist.

His greatest achievement has been his leadership of modern industrial scientific research, best exemplified by his administration of the Research Laboratory, General Electric Company.

To research Dr. Whitney added a contagious enthusiasm, undaunted courage and insatiable curiosity. He is a keen but kindly critic. He won confidence, disarmed suspicion, dissipated jealousy. He was not afraid to surround himself with great men.

Dr. Whitney's first "valuable find" was the metalized-carbon filament. By reference to the "Periodic Law," he prophesied the superiority of tungsten and thorium.

Even after he became director of research he found time to make a number of personal contributions, discovering that the positive electrode was not an essential factor in an arc lamp, contributing the non-consuming positive electrode for the magnetite lamp, discovering the effect of high-frequency radio waves in producing fever, demonstrating their usefulness and stimulating the medical profession to develop their application to the relief of human ailments. Under his direction were produced ductile tungsten, the new X-ray and cathode-ray tubes of Coolidge, inventions of Langmuir in high vacua and electronics, the gas-filled lamp and atomic-hydrogen welding.

Wide World

R. B. Bonney, vice-president A.I.E.E., presenting Edison Medal to Whitney

unit rated at 400 hp., 4,000 volts and installed to drive a power-plant fan has developed an over-all efficiency ranging from 83 to 90 per cent at 360 to 620 r.p.m. Besides having wide speed range and high torque, it has no losses in resistors.

Because of its flexible speed without sacrifice of torque, it can operate on a.c. power without regard to synchronism, may be useful as an electrical reduction gear, or used with high-speed high-frequency turbines for propulsion, although large enough units have not been developed yet, declared P. M. Currier (General Electric). L. Ludwig (Westinghouse) expressed the opinion that at the present stage of development a large market could not be expected, although it is applicable where it will do work not done before.

Philip Sporn (American Gas & Electric) declared that until now no motor has excelled the d.c. shunt motor for speed control. However, he had installed a 400-hp. Thyratron motor in one of his power plants for fan drive and will report on its performance later. So far he could only say that it is simple and rugged, although he believes the distributors should be inclosed and reduced to one distributor, and the tube life is still undetermined. Reference was made to articles on electronic applications in the power field, the first of which appears in ELECTRICAL WORLD this week.

In closing this discussion, Mr. Mittag admitted occasional loss of grid control, but declared the unit is able to run through "arc backs." Tube cost will reduce as more tubes are used. The principle is not economically applicable to motors rated as low as 1 to 50 hp. and at 220 or 440 volts, because too many tubes and larger currents at these voltages are required than present Thyratrons will handle.

It was reported by L. Ludwig (Westinghouse) that the Ignitron inverter can be made to ride through a tube failure if the next tube is made to "fire" earlier.

Comparisons of grid and Ignitron inverter performance aroused some discussion. Ionization for more than 250 microseconds (5½ electrical degrees) is not essential to operation of the grid inverter, declared C. C. Herskind (General Electric). Contamination collects in the cathode region, so it is better to place the grid in the anode region. More than 90 grid rectifiers have been installed, he declared, and very little trouble has been experienced with the grids, especially those of graphite.

Commenting on both the Thyratron motor and Ignitron inverter, R. E. Hellmund declared that speakers have been too prone to withhold difficulties with new developments and for economic reasons many have dropped out of the market. He declared that electronic motors have a drop equivalent to that in a.c. motor brushes, and the life of tubes is limited, so they do not look promising economically except for wide speed range, as in power plants. As propulsion power for steamships, he questioned their economic applicability.

Induction motor test code is circulated for comment

Circulated at the induction motor symposium (Thursday) was a very recent "preliminary proposal" for a test code for polyphase induction machines. It was the basis for a lively round-table discussion which followed the presentation of three papers aimed at clarifying the obscurities about the causes of stray losses and the discrepancies in tests to determine them. The thermal-duct method was proposed by R. E. Hellmund as having merit. A. M. MacCutcheon questioned the necessity for fractional percentage refinement in efficiency determinations and favored tolerances to cover the uncertainties in stray loss tests. He pointed out that improvement in fan and centrifugal pump efficiencies had prompted the new test code, but that those fields were looking for elimination of discrepancies of several per cent and not fractions.

P. L. Alger acknowledged the difficulty in bringing efficiency and loss determinations for induction machines to parity with those for synchronous machines, but the new proposed code, evolved after five years' study, sets up all the recognized methods of test and should ultimately clean up all legal and specification uncertainties between maker and buyer. The call is for critical analysis of all test methods and withdrawal of those with least reliability. There will be a period of adjustment of A.S.A., A.I.E.E. and N.E.M.A. requirements as the refinements progress.

Silencing Noisemakers

PROGRESS is being made in response to public demand for quieter living conditions, in so far as electrical equipment is responsible, according to the symposium on noise. Since the Rochester assembly in May, 1931, instruments have been developed for analyzing and measuring noise and steps are being taken to minimize electrical causes as well as to keep the dissemination of noise within comfort levels through design as well as application.

At least ten persons discussed the papers, opinions differing on the preferred method of measurement, and on whether to measure the total energy of noise or weight the energy of different tones according to ear response. Harvey Fletcher (Bell Laboratories) suggested that differences of choice may be due to the purposes: (1) Diagnosis of causes of noise, or (2) specifying noise levels. Among other persons he favored a meter network for weighting components of complex noise. He referred to a socket-type audiometer which covers the oral range. Some speakers favored a universal basis of reference. A. P. Fugill (Detroit Edison) declared that there should be separate references for transformer, motors, etc. But there was almost unanimous support of standardization of measurements so they will be comparable. Direct-reading meters were favored by many, so the human element could not be called into question. Purchasers and users of equipment seem to want noise meters that will enable them to specify the amount of noise allowable and to analyze causes of noise so they can be minimized or isolated. Manufacturers of equipment seem to be more interested in meters for aiding development work and checking products before shipment.

Several speakers emphasized that the major problem is to reduce the transmission of sound through structures in contact with noise producers and to prevent resonance of surrounding structures. Building walls transmit little noise, declared L. J. Gorman (New York Edison) if they are at least 50 ft. from transformers. Core vibration, which is chiefly responsible for transformer noise, can be reduced except for the fundamental and second harmonic by lower flux densities, but

tank vibration is not so predictable, says H. Fannell (Westinghouse). Regarding the discrepancies in noise measurements when harmonics are predominant, Mr. Fugill says these dwindle in importance with transformers.

Manufacturers' viewpoints on noise specifications seemed to be expressed by Mr. Fannell, who said the art has not progressed far enough so designers can prophesy the amount of noise which will be produced and how far it will be carried. Therefore, he declared, manufacturers should not be held to hard-and-fast specifications.

Personality in Engineering

INTANGIBLES were brought a few degrees nearer to the tangible in the discussion of engineering education. Epigrams were coined, such as "prize the doubt," "acquire the habit of achievement," "very few homuncular calculating machines wanted," to serve as maxims for both the graduate engineers and the schools which produce them. H. W. Bibber (Ohio State) had asserted in his paper that engineering dominance was essential because it inculcated the investigatory attitude and caused one to look at all tasks as problems to be solved and best solved by the rigor and specificity of engineering methods.

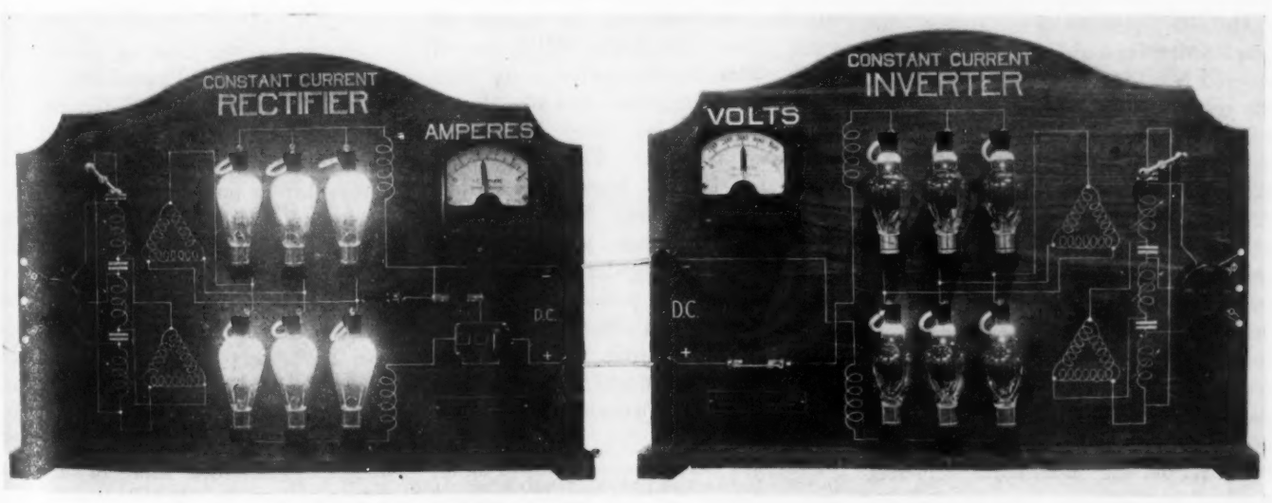
Alex Dow amplified the homely wisdom of his paper by telling how his Detroit company is operated by a council of fourteen, ten of whom are professional engineers. He rated as a compliment to engineers and to engineering education the common experience that an engineer is "grabbed off" for something else as soon as he has demonstrated his competency as an engineer. He prefers the adaptable type who is willing to tolerate "remainders in his answers." Even a man who makes a blunder, and knows he has, is to be preferred to the supercautious man who maintains an inviolate record. Flexibility in organization can be built from adaptable men, especially those who are not nonplussed in finding before them a mess of materials which they would never buy but must be made to suffice for the job.

Temperament and adaptability

Emphasis was placed by Thomas Spooner (Westinghouse) upon the influence of temperamental traits upon the success of engineers engaged in research and development. Lack of aggressiveness, want of ambition and neglect of self-improvement were serious shortcomings found in both the men who were retained and those who were released when curtailment was necessary. Ernst Weber (Brooklyn Polytechnic) felt this feature of the analysis indicated that the statistical approach employed amounted in itself to a misapplication of engineering principle to the social science of personnel rating. Likewise, he felt that engineering education is not, as Professor Bibber claimed, meeting the challenge which L. W. W. Morrow had thrown into the arena in his Hot Springs paper of last June. He also objects to making the university a laboratory for resolving the intangible and cultivating the imaginative qualities of technicalists.

On the contrary, P. L. Alger (General Electric) called technical imagination the one outstanding test of engineering success. He likened it to the ability of the engineer to see into and through his problem as the doctor envisions the skeleton and the organic assembly of the patient who stands before him though fully dressed. Such vision is an urge to immediate action. Measure of this imaginative faculty should be perfected and made a part of every test in graduating and selecting engineering talent. Alan Howard of the same organization put stress on the fact that "getting things done" was an inescapable criterion in industry and that the engineer must acquire the habit of achievement. Colleges must instill this spirit.

Genuine interest of the engineering elders in these problems of preparing the young mind was what impressed Professor Karapetoff in the papers and the discussion. His attitude is that education is a gymnasium and not a restaurant. In rebuttal, Bibber agreed with Dow that continuation education should follow one or two years of practical field experience. He said Ohio State has never had any better students than those who have come back lately, because of declining opportunities in industry, to continue their work in school after a period of practical experience in the field. Mr. Dow was also seconded by Professor Beach of Brooklyn and H. D. James of Pittsburgh in his plea that history, psychology, economics and command of language be given more prominence in engineering curricula.



Monocylic network is basis of constant-current d.c. transmission

Reserves for Jobless and Aged

Principles and Policies Looking Toward Greater Security of Workers Through Systematic Provision Against the Hazards of Unemployment and Old Age

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Blank & Stoller

AFTER the past five years, when no one felt sure of anything—his job, his government or the future of many things that once could be predicted with a fair degree of accuracy—it is not surprising that there is such a demand for something that will assure individual security. "Some way should be found, must be found," it is asserted time and again, "to make us feel reasonably certain that, with the exercise of ordinary prudence, we can escape complete economic disaster."

If the economic worries that attend contemplation of death, disability from sickness or accident, inability to find a way to earn a living and inability to earn a living because of advancing years can be successfully alleviated, the prevailing sense of insecurity will disappear.

There is only one way to protect against the economic results of any of these hazards. That is to establish by one means or another, during periods of relative abundance, reserves for time of need. Some present desires must remain ungratified to make sure that future necessities shall not be lacking. Who shall make the sacrifice and how is the practical question.

Only two sources of insecurity—unemployment and old age—will be considered here, with special reference to the responsibilities of electric and gas company managements toward their employees. Caring for persons who are unable to meet the increasingly severe standards of a competitive age and who never can, in the best of times, really earn their living will be passed over. Their support is primarily a social problem. Managers of industry should not be compelled to maintain incompetent workers on their payrolls. What we have to consider here are the problems, different yet related, of the reasonably efficient worker who cannot find a place to exercise his skill, and of the worker who has lost his efficiency because of advancing years.

Unemployment is a problem facing *all* industries and *all* businesses. Whether or not industrial leaders believe that they should assume a greater degree of responsibility for diminishing or spreading the cost of maintaining those unemployed, but capable of work, this responsibility will be forced upon them by legislation. At least one state—Wisconsin—has already enacted (1932) a law compelling unemployment reserves. Thirty or more state legislatures have the subject under consideration. The President's announced program very definitely calls for federal legislation on the subject, although the precise form it will take has not been revealed up to the date of this writing. Secretary of Labor Perkins has said: "Compulsory unemployment insurance legislation must come on lines of broad co-operation between the federal and state governments."

The light and power industry cannot expect to avoid a responsibility placed on general business, but it should not be compelled by law to contribute more than its fair share of the cost of providing reserves against unemployment. In should not be expected to care for more than its own unemployment problem, because records show that loss of employment in its ranks has been relatively much less than it has been for manufacturing industries generally.

However, since this industry may expect to be encompassed by legislation for unemployment reserves, it is the part of wisdom to study and develop methods that will be most effective without working an unfair burden on utilities compared with other industries. The principles that should govern the establishment and maintenance of such reserves are clearly and succinctly discussed in the U. S. Chamber of Commerce pamphlet entitled "Providing Reserves Against Unemployment" (June, 1934).

Cost to industry of providing unemployment reserves

Considering the cost of protecting efficient unemployed workers, there arises a question of the division of responsibility. How much must be placed on the individual, how much on the employers and how much on the government, or society as a whole. The English system, theoretically, shares among all three classes the cost of laying aside reserves in good times to tide over bad times. Actually, however, the direct burden falls chiefly on taxpayers, because employers and employees failed to contribute during their periods of relative prosperity enough to meet their share of the cost of supporting the idle during a prolonged period of adversity. No plan

*"The Hazards of Unemployment and Superannuations," a paper presented by the author before the annual meeting of the Empire State Gas and Electric Association, discussed this subject more extensively and included an excellent bibliography.

of compulsory unemployment reserves that has yet been proposed in this country offers a fund sufficient to do more than carry a worker at a much reduced standard of comfort through a few months of unemployment.

Because of the relatively stable employment in electric and gas utilities, even through depressions, this industry can build up reserves, during good times, sufficient to give unemployment relief benefits at least as great as those proposed in any bill or law so far introduced or enacted. *Provided* this industry cares for only its own unemployment problem and does not have to share the total cost of general unemployment relief, the necessary reserves could be created in two years, or very probably in one year, by setting aside not to exceed 3 per cent of the payroll. Thereafter annual appropriations to maintain the reserve should probably be less than 1 per cent. To perform its functions properly, however, such a reserve will have to be something more than a segregation of book surplus. It will have to be invested in the most readily liquidated assets.

A separate plan for each major company or operating unit could be worked out with regard to the conditions of that particular unit. A good principle to follow is to divide the employees into several classes according to their compensations and lengths of service and apportion the benefits so that the employees in the lower-paid classes receive a larger proportion of their normal pay during unemployment and the employees with the longer service receive the benefits during a longer period of unemployment.

While there is no strictly actuarial basis for computing the probabilities of demands on an unemployment reserve fund, any company can obtain statistics from its own payroll records showing employee turn-over. By a somewhat tedious but simple "trial-and-error" method, the reserve required for different assumed benefits and different numbers of beneficiaries in each class can readily be calculated. One method of setting up such a calculation is shown in the accompanying table.

A large part of the cost of providing unemployment relief during hard times should be met by reserves built up by industry during good times. The cost of creating and maintaining such reserves must be recognized as a legitimate and necessary operating expense, indisputably entering the cost of the service or product and consequently the price paid by the consumer. However, we must not delude ourselves (although it is unfortunately probable that much of the uninformed talk about "unemployment insurance" is so deluding a large number of workers) with the idea that business can accumulate in times of prosperity sufficiently large reserves to carry the enormous burden of unemployment relief through a major depression like the one which we are now suffering. The ultimate cost of unemployment relief in a great economic catastrophe which yet stops short of revolution must be met by the taxpayer.

Systematic providing for superannuated employees

Protection against the hazard of loss of earning power resulting from old age has increased at a notable rate during the past few years by corporate pension plans. It is quite likely that this process will be accelerated by legislation.

It is often argued that the cost of a systematic pension plan can be justified wholly on economic grounds and should not be considered primarily as a philanthropic or paternalistic under-

Suggested Form for Estimating Requirements for Unemployment Reserve

Classification by rate of pay:

A. Under $2,000 per year.
B. $2,000 to $3,999 per year, inclusive
C. $4,000 to $5,999 per year, inclusive.
D. $6,000 and over per year.

Classification by length of service:

Probationers, less than six months (no reserve).
1. Over six months but less than two years.
2. Two years but less than five years.
3. Five years but less than ten years.
4. Ten years and over.

The total of column (9) is the estimated maximum amount of reserve required to guarantee full unemployment benefits during any one year in the amounts and on the assumptions indicated. Note that its ratio to the total of column (3) which is the total annual payroll (excluding the pay of probationers with less than six months service) is 4.4 per cent. Note also that the benefits are, at least for the lowest paid group, considerably above those usually proposed, and that the assumption as to possible proportionate reductions in force are believed to be very conservative in relation to electric and gas company experience.

Classification	No. of Employees (1)	Average Annual Pay (2)	Total Annual Pay (3)	Percentage Who Might Be Released in Any One Year (4)	Total Weekly Pay of Released Employees* (5)	Benefit Percentages of Weekly Pay (6)	Amount of Maximum Benefit for One Week (7)	Duration of Benefits (Weeks) (8)	Amount of Maximum Benefits During One Year (9)
A1	1,400	1,000	1,400,000	20	5,385	70	3,769	13	48,997
2	2,100	1,200	2,520,000	15	7,269	70	5,088	21	106,848
3	3,400	1,500	5,100,000	15	14,712	70	10,298	29	298,642
4	2,700	1,800	4,860,000	10	9,346	70	6,542	37	242,054
B1	50	2,500	125,000	15	361	60	216	13	2,808
2	150	2,800	420,000	15	1,212	60	727	21	15,267
3	500	3,200	1,600,000	10	3,077	60	1,846	29	53,534
4	900	3,500	3,150,000	10	6,058	60	3,635	37	134,495
C1	10	4,500	45,000	10	86	50	43	13	559
2	30	5,000	150,000	10	288	50	144	21	3,024
3	50	5,200	260,000	5	250	50	125	29	3,625
4	100	5,500	550,000	5	529	50	264	37	9,768
D1	5	6,500	32,500	20	125	40	50	13	650
2	10	6,800	68,000	10	131	40	52	21	1,092
3	20	7,000	140,000	5	135	40	54	29	1,566
4	100	7,500	750,000	5	721	40	288	37	10,656
Totals	11,525		21,170,500		49,685		33,141		933,585

*Percentage, as per column (4) of 1/52 of total annual pay for each class, as per column (3).

taking. Supporting this contention it is pointed out that many large corporations are already paying large "concealed pensions." Local managers frequently retain on their payrolls old and faithful employees of long service whose usefulness has actually ended, but whom the managers feel unwilling to dismiss unless they can assure them of a comfortable pension. After the adoption of a pension plan the payroll should be relieved from carrying superannuated employees, and it is conceivable that savings from this source might be enough to offset the entire employer contribution toward the cost of a pension plan. However, it is doubtful whether such savings can ever be accurately measured, because managers are often reluctant to admit that they are soft-hearted enough to keep on paying an employee for inefficient service because of faithful service during his efficient years.

Unquestionably the existence of a well-established and secure plan which will reduce or eliminate the hazard of superannuation does make for better employee morale and consequently more efficient performance. Moreover, it will reduce turn-over costs by strengthening the inducement for an employee to remain in service.

Employees should recognize that they will ultimately pay part of the cost of reducing their hazard of superannuation *whether or not* they contribute directly to the current costs of a pension plan. While an employer may undertake to bear the entire burden of providing retirement annuities, it will be found, if the plan is successful, that consciously or unconsciously both employer and employee will come to look upon the charge for pensions as compensation for service in addition to the weekly or monthly pay envelope, as in fact it is. Employees will willingly accept as current pay a little less cash if they can be convinced that in return for such a sacrifice they will have achieved a greater security.

A pension plan, if it is to be anything more than a declaration of intention by a board of directors, must be actuarially sound. The intricate calculations necessary to determine the present and continuing cost of its future benefits should be supervised and supported by a thoroughly competent actuary. It is surprisingly easy to underestimate future pension requirements, and in most cases where estimates were not based on sound actuarial calculations the company eventually either had to abandon the plan or materially modify it.

The immediate out-of-pocket cost of providing an adequate retirement allowance is considerable, especially when it is necessary to provide within the early years of a pension plan's operation funds sufficient to buy annuities for employees of advanced age and long service.

Great caution should be exercised in using other companies' experience as a basis, because differences in average age and average length of service, and to a lesser extent rates of pay, may be great enough to cause wide fluctuations in actual annual costs. Different methods of funding a pension plan may also result in materially different costs. However, a summary of some very careful actuarial studies of a number of light and power utilities may be of interest.

Cost of pensions

In these studies the normal retirement age was taken as 65 for men and 60 for women. The minimum benefit proposed was 1 per cent of average pay for each year of service; the maximum, 1½ per cent of average pay for each year of service prior to the adoption of the plan, and 2 per cent of average pay for each subsequent year. Thus an employee retired at age 65 after twenty years of service (ten years of which was before the plan was adopted) and whose pay had averaged $3,000 per annum, would receive a retirement allowance under the minimum proposal of $600 a year (20 per cent of $3,000). With the maximum benefit (assuming that his average pay prior to the adoption of the plan had been $2,000 and, subsequent thereto, $4,000) he would receive a retirement allowance of $1,100 a year (10 × 1½ per cent or 15 per cent of $2,000 plus 10 × 2 per cent or 20 per cent of $4,000). These are obviously very far from being extravagant pensions.

For a company whose employees had an average age and average length of service approximately at the corresponding medians for the group of companies studied (say an average age of 38 and an average length of service of nine years) the costs worked out as follows: *Minimum benefits*—first twenty years, 5.3 to 8 per cent of payroll; thereafter, 2.73 to 5.09 per cent of payroll. *Maximum benefits*—first twenty years, 9.42 to 14.54 per cent of payroll; thereafter, 5.46 to 10.18 per cent of payroll. The lowest cost figures given are predicated on the assumption that the average age of the group would remain approximately constant. In actual experience the annual cost under this method of funding would steadily increase.

The cost of providing fair but not too generous pensions for a normal group of public utility employees will run from 10 to 15 per cent of payroll for the first twenty years of a sound pension plan and thereafter from 5 to 10 per cent. These figures include the total cost of annuities which may be split between employee and employer in any way agreed upon. It is quite usual for an employee to agree to contribute from 1 to 5 per cent of his pay if the plan is soundly devised and properly presented. The employer's burden can be materially lessened by general employee participation, which can usually be assured without hardship to the employees or any sacrifice of employee good will.

In calculating the cost of a pension plan it is frequently desirable to include a "discount for turn-over." For example, if a relatively large number of employees leave before retirement age, thus forfeiting their right to any pensions, the amount set aside for this purpose may be applied to reducing contributions for those who remain in service.

Pension plans have raised the objection that they discourage the hiring of men at older ages because the pension cost plus their current pay makes the total cost of their services uneconomically high. However, that is a management problem which can be satisfactorily met without any real discrimination.

When an employee is engaged at, say, 50 years of age, and but a few years before the adoption of a systematic pension plan, the allowance which the plan will provide for such a man is likely to be less than is required for any reasonable standard of comfort. In one specific instance where, because of local conditions, there happens to be a considerable number of such employees, the case of each person as he comes up for retirement is investigated and the pension to which he is entitled by the terms of the plan is supplemented by an additional special appropriation as his need may justify.

Conclusions

In my judgment, charges to create reserve funds for mitigating the hazards of unemployment and superannuation will soon be recognized not only as legitimate but as absolutely essential elements in the cost of rendering public utility service, just as the cost of compensation for industrial accidents is now universally recognized. It will be the part of wisdom for the electric and gas industry to study these costs, equipping itself to bear its fair proportion, but only its fair proportion, and be prepared to show that any charges to operating expense which it makes to meet such costs are reasonably adequate to their purpose.

Tubes on Power Systems

Thermionic Devices Applied to Synchronizing, Carrier Current Relaying and Remote Switch Control

By PHILIP SPORN . . . G. G. LANGDON
American Gas & Electric Company, New York

Power systems are beginning to use electronic devices for the sake of their properties of low inertia, low burden, practically instantaneous response, amplification and trigger action. Earliest applications have been in the "weak current" field. This company made use of tubes as far back as 1919 and has therefore had extended experience which others will want to know. For one thing the maintenance of tubes is easy and economical. Subsequent articles will deal with carrier communication and with uses involving the higher energy levels.

AN EVALUATION of the results obtained with weak current electronic devices over a period of fourteen years on our system warrants the following conclusions:

1. Most of the weak current applications have proved superior from a performance and economic standpoint to heretofore existing methods over a wide range of operating conditions, and have received acceptance as sound practice in many cases.

2. Vacuum tubes are reliable, easy to maintain and replace and economical. In weak current devices they constitute only a minor factor in the maintenance cost of the equipment of which they constitute so essential a part.

3. Proper application of weak current electronic devices on power systems can be made beneficial not only from the standpoint of the particular application, but from the standpoint of the experience and confidence that they give the designing and operating staffs in the reliability of electronic devices, thus making possible the acceptance of heavier current devices, when these in turn offer economic possibilities.

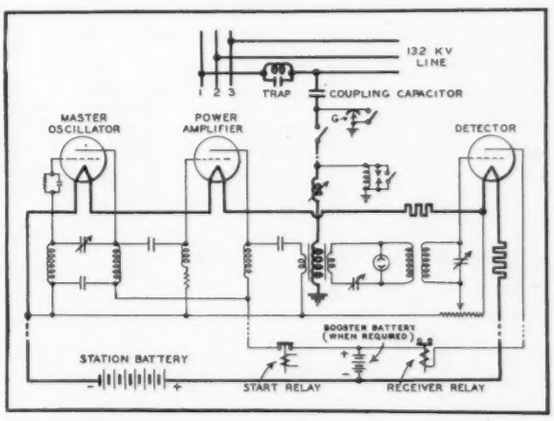
Carrier-current relaying

The simplification of the carrier-relay scheme and its practical application to the American Gas & Electric Company system has been fully described in two previous articles in the ELECTRICAL WORLD.* During the past eighteen months fourteen carrier-current relay installations were put in operation on the double-circuit sections between Philo and Fort Wayne sectionalizing stations on our 132-kv. transmission system. See Figs. 1 and 2.

Experience on these carrier-relay installations indicate that carrier relaying is reliable and effective. During this eighteen-month period about 50 internal faults were cleared satisfactorily by the carrier relays and approximately 150 external faults occurred, during which the lines were held intact. Of the 50 internal faults, four were simultaneous troubles on both circuits of a double-circuit tower line, and in each instance breakers at all terminals cleared simultaneously in less than twelve cycles. One of these four involved a double-circuit section with a tap-off station and all six breakers cleared simultaneously from the carrier-current relays.

During the eighteen months of practical operation two important carrier troubles developed which were not foreseen, these troubles being disclosed by routine checking of received signals by the station operators. One was due to a variation in the resonant frequency of the line traps during cold weather, caused by a change in the capacitor used for tuning it. Our tests disclosed that this trouble could be corrected by substituting sealed mica type capacitors in place of the oil-filled paper type capacitors originally used and trouble from this source has been eliminated. The second trouble occurred during heavy rain when received signals fell off by varying amounts for a short time, but soon returned to normal. Investigation showed that this was caused by rain-water splashed up into the protected gaps (*G*, Fig. 1) from the under side, shorting them out for a short period of time. This difficulty was corrected by increasing the gap settings and by

Fig. 1—Carrier equipment for relaying (Elementary diagram)

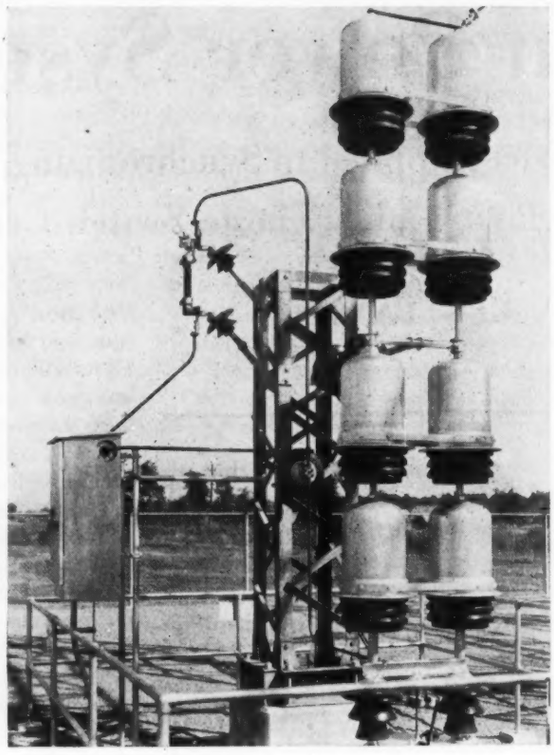


Transmitter circuit consists of a master oscillator of adequate frequency stability driving a power amplifier which delivers about 6 watts of radio-frequency to the transmission line. Receiver uses two tuned circuits working directly into the detector or relay tube, sensitivity and selectivity being adjustable within limits. Detector is normally biased below cut-off and other adjustments are made to provide adequate margin in each installation. The line trap, tuned to the carrier frequency used, serves to make carrier transmission substantially independent of switching or fault conditions outside of the protected line section. The most recent relay equipment being installed uses four type 48 tubes, with a push-pull output arrangement capable of delivering about 5 watts at 125 volts plate, 15 watts if 250 volts is used for plate supply.

*September 10, 1932, page 332, and October 28, 1933, page 556.

Fig. 2—Complete outdoor equipment for one 132-kv. carrier relay terminal

The coupling-capacitor assembly for each circuit consists of eight units assembled in a 4 x 2 series-parallel connection, each unit being rated 0.001 mfd., 46 kv. The capacitor assembly is connected for phase-to-ground coupling. The grounding switch and protective gap is mounted on the base of the capacitor stack. The lead-in from the low-voltage end of the capacitor assembly is connected to the respective outdoor carrier-current cabinet through a fused disconnecting switch. The drain coil is located inside the cabinet and is connected to the lead-in ahead of the fused disconnecting switch. The cabinet, as well as the base of the capacitor stack, is grounded to the station ground with No. 4/0 copper conductor. A pipe framework inclosure prevents employees from coming in contact with live parts, but does not prevent testing of the carrier-current equipment in the outdoor cabinet.



providing better shielding on the gaps.

These carrier-relay equipments use three type 210 general-purpose triodes. The filaments are energized continuously at normal filament voltage, but plate current flows in none of the tubes except during a fault on the transmission line or when testing. Of the 75 tubes in service in the 25 equipments installed on our system only three tube failures have occurred, these failures having been located by regular test, and it is to be expected that an average tube life of more than one but less than three years will be obtained. It is evident from the experience thus far obtained that vacuum tube replacements will be a minor item in the cost of this application and that weak or faulty tubes or other defects will be disclosed by routine testing of carrier transmission by the station operators.

It is felt that this application of vacuum tubes represents an important advance over the heretofore existing relaying methods and that the basic method used is capable of further improvements, in speed, for example, which may be required in the future.

A comparatively large number of medium-voltage transmission lines on our systems, involving both radial and loop circuits, are controlled by automatic reclosing circuit breakers located in unattended stations.† Many of these automatic substations are so located that they are 40 to 50 miles away from any regular operator or maintenance man, and a few of them are located in such remote and inaccessible places that it takes a considerable length of time, of the order of five to six hours, to get a man to them whenever there is an emergency.

In the case of a continuing line fault which causes an automatic switch at one of these substations to lock out it is necessary, before service can be restored after the line has been repaired, to reset manually the automatic reclosing equipment of the breaker. If this occurs at one of the inaccessible locations mentioned above the total time involved in restoring power will generally be too long to pass the test of satisfactory service.

For this problem a rather neat solution employing carrier current has been worked out. This consists of a comparatively simple remote-control arrangement designed so that, after lock out, one or more of the breakers at the substation or substations involved can be reclosed from some other point where an operator is normally located. In a territory equipped largely with small simplex battery-operated carrier sets the remote-control arrangement made use of the existing carrier channel to transmit a coded impulse to operate one or more selector relays at the unattended substation.

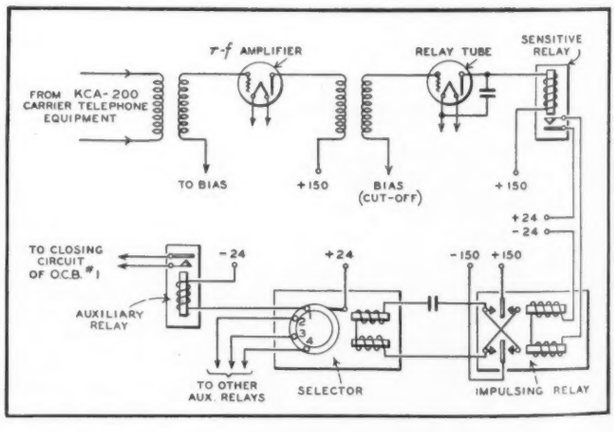
While our experience with this carrier remote-control equipment has covered too short a period of time to permit adequate maintenance or operating data to be collected, tube replacements are expected to be nominal.

From an application standpoint, it is interesting that thus far three cases of line faults have been isolated in a

Fig. 3—Carrier-current remote-control receiver

The receiving end consists of a separate carrier-current receiver, a sensitive relay, a selector and one auxiliary relay for each breaker to be controlled. It is, of course, not necessary to use a separate carrier receiver for the remote-control service, but in this case the combined receiver and selector units were on hand and their use made it unnecessary to alter the carrier-telephone equipments, which had been installed previously. Plate supply for the remote-control receiver is obtained from the 110-volt a.c. supply through a small rectifier, and filament supply is taken from the 24-volt tripping battery. The circuit breaker cannot be closed when no a.c. potential is available at the station, but this is obviously no disadvantage since service cannot be restored anyway until potential reappears.

The control receiver uses two general purpose triodes, one of these being used as an untuned radio-frequency amplifier and the other as a detector or relay tube. The filaments are energized continuously at rated voltage. The tubes and associated equipment are tested at regular intervals, along with the carrier telephone, at the particular location and maintenance costs are thereby kept low.



†*A.I.E.E. Transactions*, 1932, Vol. 51, page 1031.

few minutes time from the central remote control point, and service restoration correspondingly speeded up over what was previously possible with manual switching.

The above application of carrier control, while not new in principle, provided a service improvement by simple inexpensive means. The existence of coupling and transmitting equipment, the cost of which probably would have militated against the application, was obviously of great help in keeping the expense down.

Vacuum tube synchronizing equipment

About eight years ago it became desirable to provide synchronizing facilities at seven 132-kv. stations, and since the cost of using potential transformers for this purpose was almost prohibitive due to the number of circuits involved, the much less expensive vacuum tube type of synchronizing equipment was installed at these stations.

With this system approximately 35 volts potential is taken from the oil circuit breaker bushing by means of a low energy capacitance device. This is amplified in an individual outdoor amplifier using one type 210 7½-watt tube, and is further amplified in a common indoor amplifier using one type 211 50-watt tube, the output of which is used to operate a low energy synchroscope.

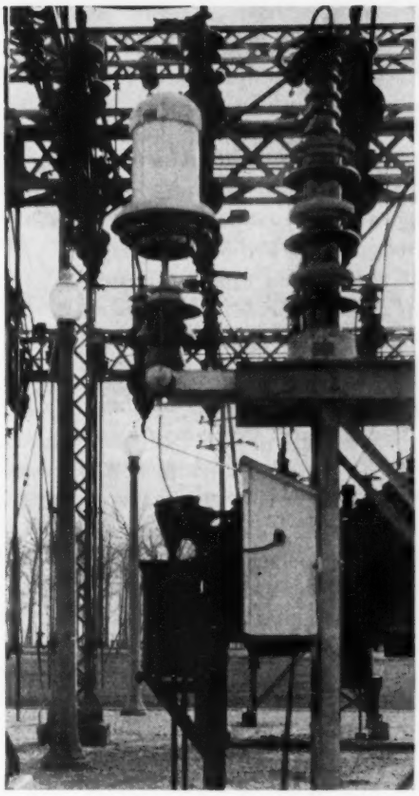


Fig. 4—Typical phase-ground capacitor coupling installation on 33-kv. line

These equipments have operated to our entire satisfaction and are considered by the operating personnel to be equally as reliable as other synchronizing methods. The vacuum tubes are left cold at all times except when the equipment is being used for synchronizing, consequently tube replacements have been rare. Over the past eight years we have had one case of a ground on the armature of the generator used to supply plate potential for the vacuum tubes and about six cases of identical trouble due to a wire-wound resistor opening up. These troubles were disclosed during the first few years' operation by the regular tests carried out.

Other than that which has been noted above, maintenance has consisted almost entirely of routine checking of the synchroscope equipment by the station operators.

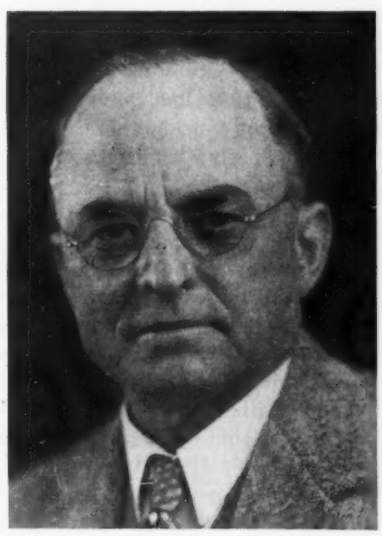
Development of vacuum tube synchronizing equipment and its associated low energy capacitance bushing transformer and synchroscope led directly to the development of a high energy capacitance bushing transformer and network device capable of operating the synchroscopes directly and making it unnecessary to utilize the vacuum tube arrangement. This development proved less expensive than the first scheme except for additions to stations which had already been equipped with the earlier vacuum tube arrangement.

Element of Chance in Research

Dr. Willis R. Whitney, recipient of Edison Medal, reminiscing, said:

"It is not always necessary to have the right hypothesis for a research, provided the suggested work can be carried out. Poor hypotheses sometimes lead to new utilities, just as the wrong horse sometimes wins the race . . .

"Through some error in shipment, the new stock of filaments (referring to development of metallized-graphite filaments) were not the simple base or coke material we had previously used, but were finished complex filaments with their graphite coats. When these were put through our heating process, they came out very bad indeed. The surfaces were wrinkled and irregular, and there were countless hollow warts or tiny burst balloons of graphite on them. These balloons had been blown up by the gases coming from the impure coke base which could not so easily penetrate the semi-liquid or dense graphite coat.



"Yet the life of these filaments in lamps was better than usual. I was sure of the value of the oxide hypothesis, and it seemed only a question of preheating the bases, before putting on the graphite, in order to get rid of the irregularities.

"Mr. Howell, dean of lamp makers, early called our attention to the fact that we had made a new form of graphite, to which the improved quality of the lamp was attributed. . .

"Under these conditions it was no great disappointment to learn that the explanation of the new quality was not necessarily dependent on the starting hypothesis."

Purchased Power in Breweries

Breweries constitute just one group of industrials which, because they use large quantities of process steam, have often considered it economical to operate on steam or generate their own power. The writer, who has served several breweries during pre-prohibition and prohibition eras as consultant, reports that the majority of these have been convinced of the economy of purchased power. His analysis of their processes, motive-power and control requirements and their concurrent use of steam and power reveal facts that have their counterpart in other process-steam and waste-heat-using industries. It should be of value to utility power-salesmen, electrical manufacturers and private-plant users alike.

By GILBERT WILKES
Consulting Engineer, Reading, Pa.*

EXPERIENCE gained as a consultant to several breweries has shown that in small towns having normal power rates the private generation of power or the use of steam for power has but slight chance of justification in the medium-sized brewery. Those plants which are not handicapped by the high operating and overhead costs of steam-driven equipment have been found better equipped to compete successfully in this business, where competition is probably more severe, at present, than in any other. In the good old days the market was active and probably provided sufficient profit to permit a brewery to survive in spite of wastage and high operating costs and investments. Taxes were lower and racketeering conditions were not so prevalent.

Judging from recent failures, however, the margin of profit is no longer the same, and wise owners are quick to avail themselves of any saving that electrification presents. These are to be found in the elimination of steam wastage by stopping all reciprocating engines, in the elimination of pipe loss whenever steam is not required, by reducing the number of firemen and mechanics previously needed, and by the lower maintenance and overhead costs encountered with electrically driven machines. Of the several breweries that were reconditioned during the pre-prohibition and prohibition eras, the majority were converted to purchased power.

Problems encountered ranged from converting the processes to modern, accepted practices to elimination of wasteful equipment. In a few instances very expensive methods of operation had to be changed. In one small plant, particularly, it had been the habit since 1882 to boil the brew water for twelve hours. This had to be shortened gradually before the savings available by intermittent boiler operation were possible. In another instance the consumption of the electric ammonia compressor was exorbitant and the unit had been shut down in favor of a steam unit. Investigation revealed a $\frac{3}{4}$-in. coating of lime on the condenser tubes. Following a tedious week of tube scraping the electric unit was returned to satisfactory service.

Flow Charts of Economical Electrified Plants—The accompanying flow diagrams were developed to assist in the study of breweries to spot the economies available by good operation with purchased power. Details of these cycles vary from plant to plant, according to the type of product and to local conditions, but these diagrams have proved of considerable assistance in locating points where improvements could be made.

Uses of Exhaust Steam Fallacious—The principal argument in favor of the private generation of power by steam is that the exhaust can be used for heat. This is rarely true, or the use of exhaust steam is so slight as to be negligible. Ordinarily, the only application available for oily exhaust is in the hot brewing-water tank. This use can be economically reduced in many plants by passing a certain amount of the hottest wort-cooling water to the brew-water storage, as shown. Furthermore, the heaviest demands for power occur during periods of wort cooling, which last two or three hours and occur eight or ten hours after the hot water has to be used. The possibility of recuperating an appreciable fraction of the exhaust steam is therefore remote.

In larger towns it is often necessary to dry the "spent" grains by steam. This operation does afford a considerable use for exhaust steam, but should be avoided whenever possible. Spent grains, whether fresh or dried, are used for cattle feed, but the fresh moist grain coming directly from the mash tub is preferable and generally well received by farmers within hauling distance of the brewery.

Exhaust steam cannot be used to advantage in other departments outside of building heating, which is generally very small. In auxiliary services, such as barrel washers, filter mass† washers, bottle washers and pasteurizers, live steam is generally injected directly in the baths without the use of the closed coils necessary for the use of oily exhausts. However, the alkali baths in the usual bottle washers are heated by coils in which oily exhaust of sufficient pressure could be used, but these baths operate on a closed cycle and require relatively little steam.

The accompanying curves show the total steam used in an actual plant for a week and are particularly interesting from a power-sales standpoint, because they show how long the boilers may be idle in actual practice.

One of the hardest plants to electrify completely had a 125-bbl. kettle. Brewing was continuous, night and day, Saturdays and Sundays. This plant operated a 35-ton electric ammonia compressor and a 65-ton Corliss steam compressor. The owner maintained, rightly, that there would be no savings available in labor expense by shutting down the steam compressor because of his high rate of production, necessitating live steam at all hours of the day and night. He further contended that the plant could not be operated on the single electric compressor. It was necessary to perform two tests while producing 370 bbl. per day to prove that not only the electric

*Recently elected president of the Shore Beverage Company, Salisbury, Md.

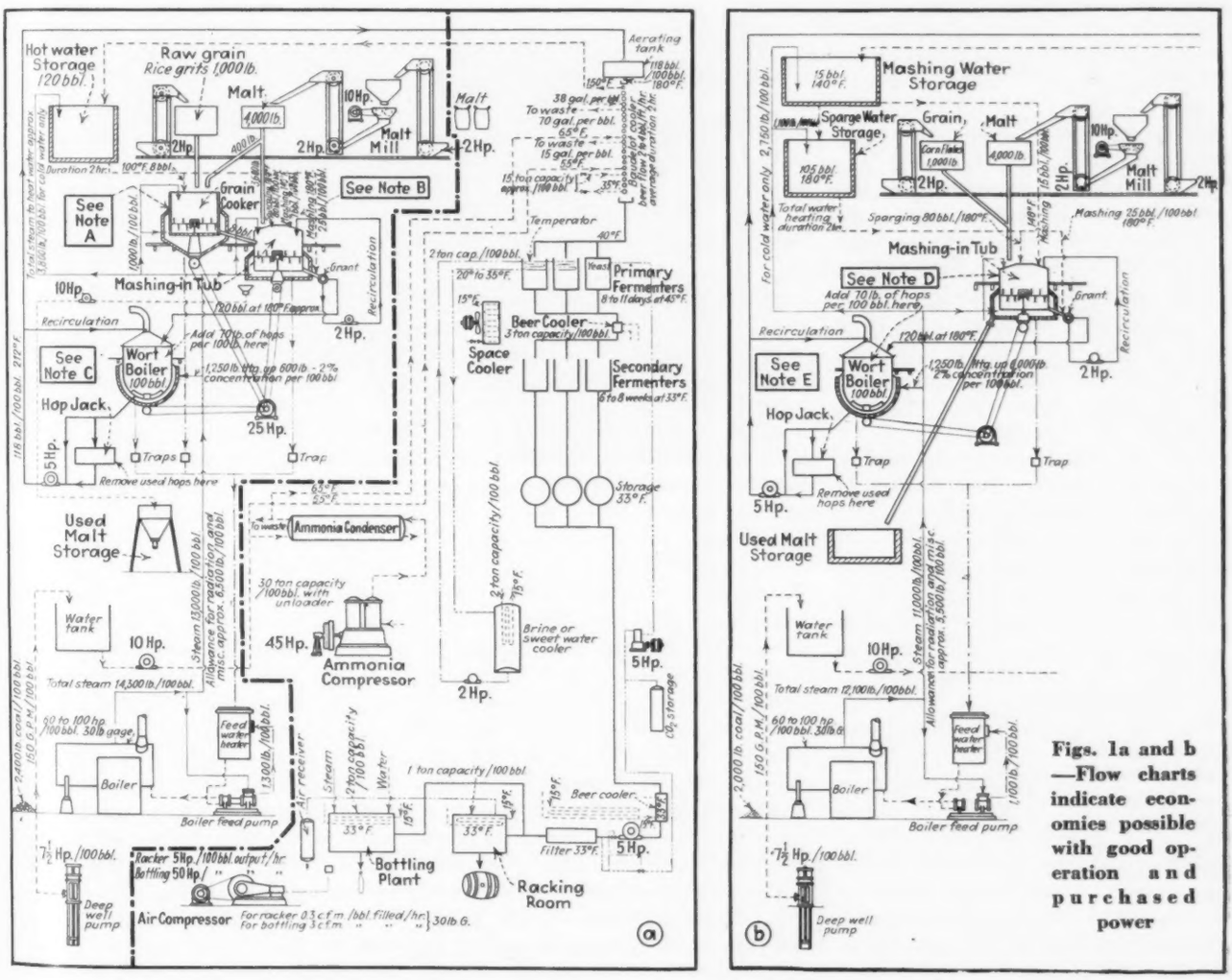
†A fibrous wood-pulp filtering medium.

compressor was capable of carrying all the refrigeration load, but also that, by closing down the steam-driven compressor, a substantial saving would be obtained. However, the owner, being of suspicious nature, retained the steam compressor, just to be sure that the utility would not jump the rate to a higher value, should he have it removed.

In both plants it was difficult to operate with less than 50 men, including brewing help and mechanics. In contrast to these, a small modern 100-bbl. plant laid out entirely for the use of purchased power obtains steam for brewing from an automatically operated oil-fired boiler of 100 hp. All mechanical services are performed by purchased power. Thanks to the efficient layout of the equipment and the simplified operation of the electric equipment, it is claimed that this complete plant is operated by three men, except when racking and bottling are performed during brewing periods, when additional help is necessary.

Successful conversion of a brewing plant to purchased power depends as much on the satisfaction of the operators with the new equipment as on the economies obtainable by the owner. Production of a questionable product has sometimes been laid at the door of new equipment by operators not thoroughly versed in its use, or not in sympathy with slight changes in technique that may have been introduced to secure increased economy from the conversion.

Drive and Control for Refrigeration—As the refrigeration load is the largest in the plant, it is usually supplied by a synchronous motor for power-factor correction. The motor should be kept on the line as much as possible, particularly where ratcheted reactive meters are used. With a constant-displacement machine this is not possible without wasting power. In one instance a single constant-displacement compressor capable of carrying peak summer loads was installed during prohibition, when competent engineering was not available. This machine was so large that most of the time the old variable-speed steam compressors



Figs. 1a and b—Flow charts indicate economies possible with good operation and purchased power

Both apply to the infusion brewing cycle. The first applies to a cycle using raw grains (corn or rice grits). That portion to the left of the heavy dash-dot dividing line is the only part which changes when the cycle involves use of precooked corn flakes. The figures were adapted from a plant producing a medium-quality beer and the data apply to 100 bbl. per brew per day. Electric consumption is 7-12 kw.-hr. per barrel.

Note A—Heat to 131° F. for 15 minutes. Then heat to 212° F. for twenty minutes. Add 100° water to reduce temperature to 140° F. and pass to mash tub. Duration one hour.

Note B—Mash cooked grains and malt with 7 bbl. 140° F. water giving final temperature of 110° F. Heat to 140° F. by adding 25 bbl. of 180° water. Hold twenty minutes for saccharification. Drain off clear wort at 170° F. and sparge with 180° water. Duration four to eight hours.

Note C—Raise temperature to 212° F. to sterilize, flocculate, concentrate (optional) and extract hops principles (2 to 4 hr.).

Note D—Mash in with 15 bbl. at 140° F. giving mash at 110° F. Heat to 140° F. by adding 25 bbl. of 180° water, hold for 20 min. for saccharification. Drain off clear wort at 170° F. and sparge with 180° water. Duration four to eight hours.

Note E—Raise temperature to 212° F. to sterilize, flocculate, concentrate (optional) and extract hops principles. Duration two to four hours.

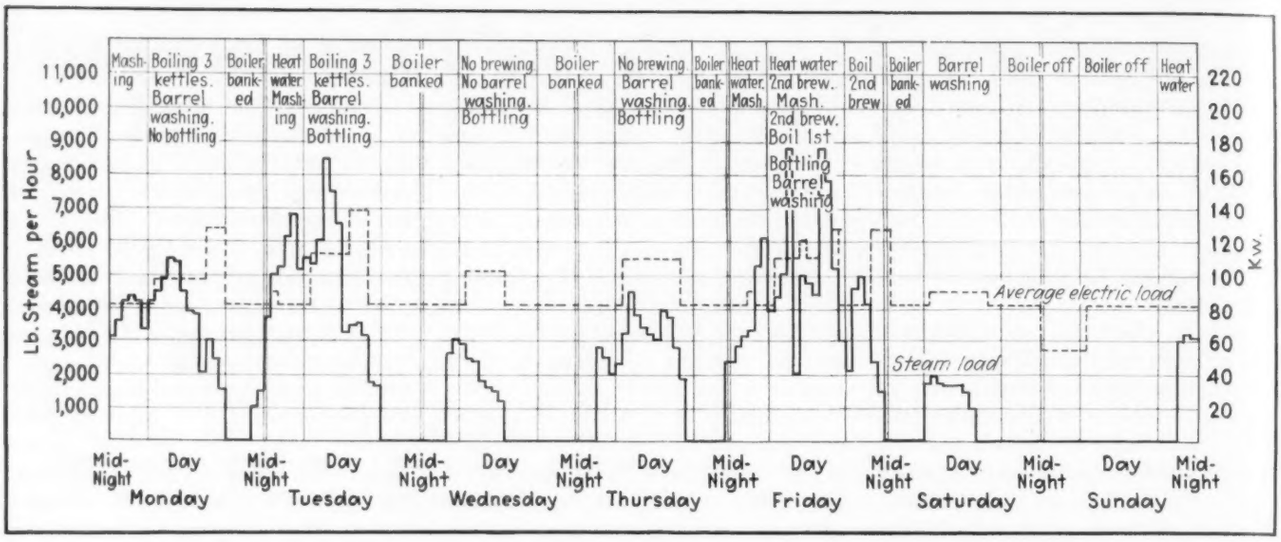


Fig. 2—Steam and power consumption not necessarily proportional nor concurrent

This plant contained two kettles totaling 210 bbl. net output. A special method of brewing was developed here to permit an increase in output of 40 per cent per brew, which involved filling the smaller kettle twice. This lengthened the periods of steam demands for wort boiling, but even in this plant the curves show that the electrical or mechanical load peak does not correspond with the steam peak and is quite separated from the period of brew water heating. These curves were taken some time after electrification of the main equipment in the plant, which incidentally afforded large savings.

were more economical and were operated preferably.

A very serious complaint about several electric-drive installations is the tripping out of the refrigeration compressor during thunderstorms. This occurs at the worst possible time, as storms are more prevalent in the early summer, and mostly in the afternoon, when the heaviest refrigeration demands exist. When the compressor trips out, the flow of wort over the cooler must be immediately stopped by the cellar boss, who is obliged to communicate with the engineer before he can restore the normal flow of wort. The possibility of this complaint can be eliminated by the use of an automatic compressor-unloader that operates on a variation of line frequency to convert the synchronous motor to induction operation and to remove the compressor load until the disturbance has passed.

Direct current has been used to a very large extent, because of its adjustable-speed possibilities, for driving pumps and other equipment. Although its continued use is neither necessary nor advisable from a maintenance standpoint, it is usually impossible to change over all the equipment to alternating current in one step without involving too great an investment for conversion.

To eliminate boiler operation, whenever possible, it is necessary to replace the usual slide-valve engine generators with a motor-generator set. The engineers will soon prefer the operation of the motor-generator set to that of the old engines and its use will generally prove more economical.

Whenever a pump is replaced, it should be with an alternating-current unit. Constant-speed centrifugals have been found entirely satisfactory, despite brewers' misgivings. It is wise to make sure that the old suction piping provides ample flow for the new pump and should be revamped entirely, if inadequate. To pump carbonated beer without trouble required that the liquid be fed to the pump under pressure. When this is not obtained, not only the pump will not operate satisfactorily, but so much foaming will occur that it will be impossible to fill vats. The cost of a hand valve on the new pump discharge, permitting variable output by throttling, is generally well repaid.

Sources of Waste—Equipment of efficiency should be pointed out to the owners and eliminated, if possible. When a plant is operated by steam so much heat is lost in the boiler plant and piping that the saving of a small wastage has little influence on the coal bill. However, when buying power every item of expense is apt to be scrutinized with a critical eye.

Of all steam hogs, the old non-expanding air compressor has probably the largest appetite, and the replacement of these units in favor of more efficient electric equipment has contributed to the satisfaction of the owners using purchased power in several instances. When the size of the new compressor is determined the possible conversion of work previously performed by compressed air to electricity should be given careful thought. In some plants reciprocating cellar pumps operated with air can be replaced by low-cost a.c. units. Elimination of old filter "mass" washers, requiring large quantities of air for agitation, in favor of modern machines in which this agitation is secured by a pump, can often be justified on the basis of less wastage of mass and better washing. Air lift can often be eliminated with profit.

Air leaks, or the quite general practice, by old timers, of allowing air safety valves to blow free just to be sure that the pressure is maintained constant, should be stopped before the new compressor is determined. Racking machines and other equipment using compressed air are equipped with pressure gages and regulating valves, but it is sometimes difficult to make old-time operators use these devices rather than judge the pressure by the pitch of the whistling air discharge by the "safeties."

These suggested changes will often reduce the size of the compressor needed to a point where the more desirable water- or glycerine-lubricated types can be justified. Air from this machine will then be satisfactory for the racker, for transferring beer and for bottling.

The release of much of the accompanying data ard flow charts developed for the E. M. Gilbert Engineering Corporation is acknowledged with thanks.

Winter Brings Utility Rise

Utility earnings widened their lead over 1933; domestic use rose further, while sustained power sales reflect industrial progress.

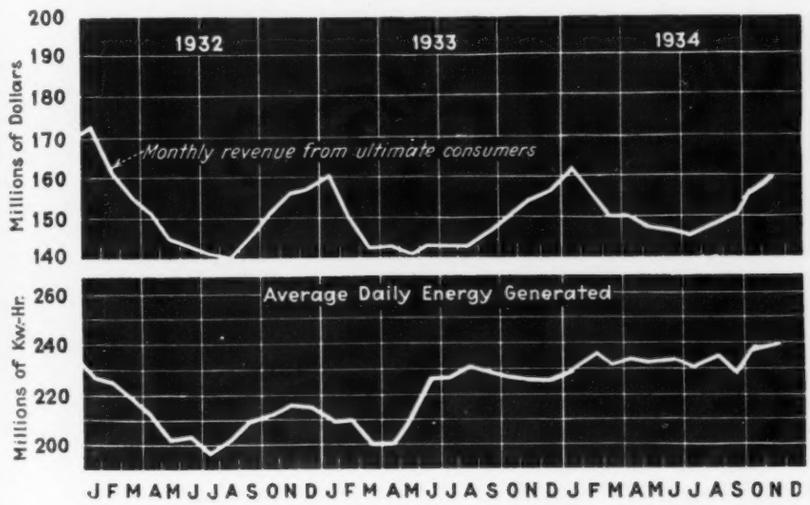
NOVEMBER returns on the operations of electric light and power companies reveal several features that are not only favorable as to the industry but also indicative of the progress being made by the country as a whole in working its way upward. Revenue from ultimate consumers, announced by the Edison Electric Institute as $160,450,500, gained 4.2 per cent compared with the like month of 1933, 3 per cent over October and 9.5 per cent over July, which was the year's low month.

Energy production rose 6.7 per cent over November, 1933, to 7,199,000,000 kw.-hr. Expressed in terms of average daily output it gained slightly over October and was the largest for any month since the beginning of 1931. It more than matched that of November, 1930, which shows that a great deal of lost ground has been regained.

Most prominent among the several consumer groups is the increase of 8.1 per cent in domestic use over the same month last year, shown in Table III. Sales in this class continue to outrun those of any other year, and it is evident that this winter's peak will bring the highest monthly consumption ever attained.

Retail commercial sales increased 4 per cent over October and 5.4 per cent over November, 1933.

Commercial sales to large light and power customers gained 4.4 per cent compared with 1933, closely approaching 3,000,000,000 kw.-hr. Though short of the October figure they actually reflect a heightened rate of consumption when allowance is made for Sundays and holidays.



Progress in industrial areas

Excepting a small decrease in the Southwest, revenues in all sections of the country were larger than a year ago. New England, after lagging slightly for a couple of months, is again over the line with a gain of 1.7 per cent. The rise over October exceeded 5 per cent. In the Middle Atlantic states the October gain in excess of 6 per cent was duplicated, and in the East North Central the advance of 3.2 per cent was better than in any month since July.

Energy production from water power increased. It was 33 per cent of the total output in September, 34 per cent in October and 39 per cent in November. Energy from fuels was slightly less than a year ago.

Table I—Monthly Revenue from Ultimate Consumers and Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1934	Revenue from Ultimate Consumers		Energy Generated, Millions of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent. Inc.
November	160,451	+4.2	7,199	+6.7	2,794	+21.3	4,405	—1.2
October	155,811	+3.6	7,421	+5.5	2,548	+ 4.7	4,872	+6.0
September	150,196	+2.4	6,845	—1.0	2,272	—16.2	4,573	+9.1
August	148,465	+3.5	7,317	+1.4	2,339	—13.3	4,978	+10.3

Table II—Regional Revenue and Energy Output in November, 1934

Compared with Corresponding Month of Previous Year

Geographical Region	Revenue from Ult. Consumers		Energy Generated, Millions of Kw.-Hr *					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.	Gen.	Per Cent Inc.
United States	160,451	+ 4.2	7,199	+ 6.7	2,794	+21.3	4,405	— 1.2
New England	13,904	+ 1.7	513	+ 2.1	280	+30.7	233	—19.4
Middle Atlantic	49,185	+ 6.2	1,849	+ 5.0	557	+21.0	1,292	— 0.7
East No. Central	35,482	+ 3.2	1,685	+ 4.3	202	+55.0	1,483	0
West No. Central	13,575	+ 5.9	480	+12.7	124	+52.5	356	+ 4.0
South Atlantic } East So. Central }	19,854	+ 3.2	820 347	+ 7.7 +37.0	509 293	+49.3 +44.5	311 54	—26.0 + 6.0
West So. Central	8,570	— 0.7	362	+ 7.0	8	+15.8	354	+ 7.0
Mountain	4,848	+10.0	247	+ 7.7	170	— 6.8	77	+66.0
Pacific	15,033	+ 3.6	896	+ 3.3	651	— 5.0	245	+35.0

*By courtesy of U. S. Geological Survey, with deductions for operations not regarded as central station.

Table III—Allocation of Energy, November, 1934

Compared with Corresponding Month of Previous Year

Class of Service	Millions of Kw.-Hr.	Per Cent Inc.
Total for distribution*	7,160	+ 4.8
Lost in transmission, etc.	1,171	+ 5.0
Sold to ultimate consumers	5,989	+ 4.8
Domestic	1,168	+ 8.1
Com'l, small light and power	1,158	+ 5.1
Com'l, large light and power	2,989	+ 4.4
Municipal street lighting	203	+ 3.4
Railways—street, interurban	361	+ 2.3
Railroads—electrified steam	56	— 3.9
Municipal and miscellaneous	54	—14.3

*Generated, purchased from other sources, imported, less energy used in railway and other departments.

One of a Series of Intimate Talks with Industry Executives

McLaughlin on Good Will

An Interview by
BERKELEY SNOW

SOME thirty years ago, when it was little more than an overgrown country town, Seattle built its first hydro-electric plant to compete with the private company. Today, with millions invested, its city light system stands as probably the most ambitious municipal power operation in the country. Tacoma's power venture antedates that of Seattle and has attained a strong position.

These two "hot spots" of governmental competition lie in the very heart of the territory served by the Puget Sound Power & Light Company. It can be understood, therefore, that this company occupies a unique position in the electric utility industry.

Four years ago, early in the depression, Frank McLaughlin came into the picture as head of the company. He came from the South, with fresh ideas as to how a utility company should deport itself, and free from all local prejudices. His success in strengthening his company's position in the community gives importance to his views on gaining public good will.

These views he recently expressed to me in his quiet, good-natured way. They impressed me, because he sees his problem not only in its local aspect but as a part of the fundamental situation of the entire industry.

"Speaking broadly," he said, "the confidence of many people in the light and power industry has been shaken and undermined. Seemingly, our most precious possession has gone out of the window and the demagogues and the public ownership advocates are running away with it. We may be open to the charge of having been careless with so valuable an asset as public good will. The important question is, what are we going to do about it?

"I believe there is only one thing for us to do about it, and that is to rebuild by word and by deed this shattered public confidence. Our service can be preserved only if our customers will it. They must be convinced that we are genuinely working in their best interests. They must see that we are content to obtain a fair reward only on the basis of our performance in discharging the obligations of a public trust to the satisfaction of all concerned.

"The light and power utilities have done a constructive job. They have made electricity available over wide areas at low cost. By and large, the private companies have built a solid foundation for service to the American people. When one gets down to the quality of the service rendered and the small amount electricity costs, in comparison with what it accomplishes, he is bound to admit that it has taken something besides pawnbroking to pioneer this development. The sad part of it all is that the people do not realize this. Apparently we have not given them an understanding of their personal interest in our business. I believe this must be done if we are to work out of our difficulties.

Defense plus reform

"But I would go a step further to say that the mere telling of our story will not be our salvation. We must be prepared to be judged on the merits of our performance against the toughest and unfairest kind of competition. We must go to the people with clean hands and the spirit of service uppermost in our minds. And to the extent that we are doing things that are not in the public interest, we must reform ourselves. Any unethical or improper practices must be cut out. Where rates are too high they should be reduced. We should aggressively plan and diligently work for greater use of electricity at lower rates."

I asked Mr. McLaughlin if he could recommend any definite course of action. "Can you suggest just how a power company should set out to rebuild and preserve public confidence and customer good will?"

His answer was: "No. As far as I know there is no magic formula for this. It is something that must be earned and merited through a satisfying service and a business relationship that has proved mutually advantageous. By our acts we shall be judged.

"But I am convinced," he continued, "that something must be done to offset the avalanche of 'public power' propaganda. Its claims of magic healing through the beneficent qualities of political operation and with its wholesale denunciation of the practices of private companies is constantly confusing the public mind. It seems to me that it will be our own fault, and a failure to measure up to our obligations, if we do not courageously and vigorously defend ourselves from all unjust attacks by correcting false statements, straightening out erroneous impressions and refuting wicked insinuations. If we do not give the people our side of the case, no one will."

Mr. McLaughlin referred to his unique newspaper advertising campaign, in which his own personally signed letters to customers were printed. Various economic aspects of the business were portrayed in graphic and cartoon style. An interesting and entertaining story was told that made a deep impression.

"Let's go to the people with our case," he said. "Let's give them the facts about our business, through the press, the radio and by personal contact. Our job is to convince the people that we have not betrayed our trust, that the good things we have done far outweigh our delinquencies, that we are best qualified by experience to advance the public welfare by developing a more extensive electric service at lower rates. Then let's back this all up with a sterling performance. Let's put our trust in the honesty and spirit of fair play inherent in the average American. For though the people may lose faith in us, it will be just too bad if we lose faith in the people."

JAMES FRANK McLAUGHLIN, president of the Puget Sound Power & Light Company, Seattle, one of the younger utility executives with wide operating and management experience in the South and West and in competition with strong municipal enterprises, a believer in taking the utilities' story directly to the people.

ELECTRICAL WORLD

L. W. W. MORROW · EDITOR

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Holding Company Regulation Advocated by Washington

FEDERAL regulation of the utility holding company is the major program advocated by the Federal Trade and the Federal Power Commissions these days. Both are anxious to take over the work and both exaggerate its importance and necessity. Generalization about holding companies is meaningless, because there are and have been so many kinds and types and because the history of these organizations has been as variable as their form. Holding companies today have little to fear from federal regulation, because they have, in general, reorganized to meet present conditions in the industry. They serve a useful purpose and their services are performed largely on an income derived solely from the interest and dividends available from their investment portfolios. The old days of high finance and overnight speculative holding companies have passed.

In the expansion and building era the holding company made possible the money, the uniform policies and the extension of electrical facilities into nearly all areas. They were responsible for the expansion of local metropolitan systems into the far-flung network of stations and lines that make our power supply so universal and so economical. The speculation associated with some of these operations and the value of many of the securities issued in this period have long since gone, but the tangible service facilities remain and are in operation to the benefit of the industry and the public.

The legitimate form of holding company is necessary today. Legislation and regulation will have as little permanent harmful effect on the real beneficial functions of holding companies as the actions in past years to dissolve Standard Oil and other enterprises. Abuses will be corrected, if any still exist, and corporate structures will be further simplified, but the chief accomplishment will be to establish the form and the place of the holding company as a legitimate part of the utility business.

A.I.E.E. Convention— Technical, Practical, Social

DOMINANT place as a forum for practical and economical engineering is manifestly being accorded to the American Institute of Electrical Engineers. That was demonstrated in convincing manner in last week's convention and with it the ease with which this can be effected without diverting the discussions into channels that are the province of agencies with less technical and more commercial objectives and precepts. One innovation made last year—informal round-table conferences subsequent to formal paper discussion—was brought into fuller fruition this year and was hailed by many as affording a much-needed opportunity to talk intimately, frankly and constructively of the problems that face maker and user in putting electro-technology smoothly on the highest plane of social service responsibility.

Fuller appreciation of the direct service function to engineers generally and their engineering world has brought a fine balance between theoretical rigidity and dollar practicality. For example, getting the last ounce of efficiency is studied with research thoroughness, but flavored in the designed result with realization that changing cost relations are rendering moderate efficiencies (turbines, transformers, induction motors, welding generators) quite acceptable. Again, transients in welding generators were the subject of erudite presentation, but the operating comments indicated that transients might well be the source of the difference between good and bad stainless steel welds even if ignorance of what really happens in the arc does not permit a clear-cut answer in design. In short, some of the diffusive academic character of former conventions has yielded favorably toward the practical side, and this without in any deplorable measure lowering the high motivation of the institute as a professional society.

Ready for a chance to prove its practicality is a rather revolutionary scheme to put transmission back on a d.c. basis. Accorded high place as a brilliant piece of research which ties the modern electronic device into Steinmetz's monocyclic square, the circuit set-up is not offered, nor was it accepted as a panacea for all transmission ills, nor is there any justification for envisioning a super-transmission mesh to tie Maine's Passamaquoddy with Arizona's Boulder Dam. Doubtless some courageous utility will before long give it a try-out in modest manner in some situation where it will have an opportunity to prove itself to be a means of getting higher economy out of circuit investment between stations and loads in a semi-metropolitan area.

Educating the educated and the educator is a phrase that may well be applied to this convention. President Johnson pointed out in his opening paper that the institute has enhanced its service value in this direction. That education is not by any means purely

technical. It includes active participation in the movements through American Engineering Council and the Engineers Council for Professional Development to bring engineering talent to public service and bring governmental machinery into service to the engineer in his professional capacity. It includes also a much-wanted chance for the employer of engineering talent to guide the engineer-factories in turning out a product that meets today's need for a staff man who can do a superior technical job and still be a citizen, a human being and a social being. With this function added to the enlargement of the engineer's knowledge of useful technical advances the convention confirmed the ambition of the institute's leaders to give it a revived recognition of its broad usefulness as the thought center for all electrical technical men.

Interpreted broadly, the deliberations indicate that there has been little of the nature of a moratorium in engineering. Even if the rest of the world is loath to sense it, the engineer knows instinctively that the progress of modern society rests upon the improvement of the material world about us. He never ceases activity in that realm and lately he also is remolding himself temperamentally and civically so as to correlate his tangible talents with the less tangible factors in the economic and political world. The engineer now has a big part at Washington, and that will be still bigger in local areas as the professional society perfects its machinery for his enhancement individually and collectively. This sentiment underlies the intricate formulas and diagrams that dot the convention papers.

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Electronic Devices Are Entering Power Systems

THOSE who predicted that the current decade in power would be an electronic decade were a trifle bullish on tubes. They overlooked, other than the unpredictable depression, a number of important factors. Thus, they failed to take into consideration the vast amount of developmental work that had to be undertaken and the natural inertia of the present generation of engineers in responsible executive positions, resulting from their lack of early familiarity with electronic devices.

In spite of these difficulties, some manufacturers and a few companies have gone ahead and have expanded the field of tubes on power systems. As a result there are today in use successful electronic devices in the power field that offer distinct advantages over any other type. This is particularly true of low-energy or weak current devices for carrier-current relaying, communication, control and other similar devices. In the field of higher-energy-level tubes progress has been more slow, but has picked up most notably during the past three years. Within that time grid-controlled rectifier tubes have been applied to alternator regulators, to battery charging, to the supply of excitation for a.c. synchronous machines and to variable-speed motor drives.

All these developments will be covered in a series of four articles, the first one appearing in this issue. The authors, with a broad power system and tube background, will not only give a survey of tube development on power systems but will go into, and lay special stress on, the electronic features of the applications. The entire series will thus serve a dual purpose; it will be an account of what has been accomplished to date and will act as a signpost indicating where we will go from here.

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Paris Practice Suggests Opportunity

NUMEROUS Paris sidewalk cafés are utilizing novel unit-type electric-heater-blowers to make it more comfortable for their patrons in winter, according to a recent issue of *BIP*, a publication of La Société pour le Developement des Applications de l'Electricité, Paris. In view of the fact that Americans have usually considered indoor heating by electricity somewhat of a luxury, this application for warming people seated outdoors under conditions comparable to a raw or rainy fall or early spring day in our northern latitudes raises the question whether electric heat has been used here as extensively as it might be.

The chief feature which characterizes the various outdoor heaters used there is that they are in portable cabinet form and discharge the heated air in all directions at a fairly low level, usually below the knees and seldom above the shoulders when seated. As a result the cold blanket of air that settled to the floor is dispelled and enough heat rises around the patrons to keep them comfortable without submitting to a draft.

Quoting the source of this information, J. E. G. Landré: "This movement constitutes not merely a fad but a progressive step . . . The apparatus is not a luxury available only to high-class establishments; even the little café can satisfy and increase its clientele with a single unit judiciously placed in the center of the terrace."

Using this principle of removing the chill of fall and early spring days, aren't there opportunities in the homes of this country, especially in the South or on the Pacific Coast, to use electric heat until the more severe winter weather demands steam or hot-water heating? It is during such periods that it is relatively most expensive to operate coal-fired heating systems, considering the heat required. The cabinet blower-heater can be designed to harmonize with furniture or the idea can be built into the most frequently used rooms. It is an opportunity worth considering.

Consolidated Offer Vetoed by Board

In proposals to Public Service Commission New York utilities ask 7 per cent return — LaGuardia scoffs at suggestions — Second offer is made to federal government

The New York Public Service Commission has voted unanimously to reject the offer of the Consolidated Gas System of a 6 per cent cut in electric rates in New York City and Westchester County, amounting to $10,000,000, in connection with putting into effect the Washington plan of rate reduction. The Consolidated plan involves the unification of its fourteen subsidiary corporations into one giant company. The rejection of the offer by the commission does not end the negotiations between it and the Consolidated Gas group. The company offer was made for bargaining purposes only and the bargaining procedure is still in its early stages.

Under the plan the company would be allowed and guaranteed a return of 7 per cent on its capital assets. These are valued at a total of about $1,200,000,000, but this rate base would be reduced by about $85,000,000 before the plan went into effect, making the total upon which the company would draw its return $1,119,000,000. One of the provisions in the company's offer was that of including taxes in operating costs. Under that arrangement the utility taxes levied by the city would be borne by consumers. Uniform rates would prevail in New York City, although rating zones might be established in Westchester County. Submetering and resale of electricity would be forbidden. Announcement of the Consolidated plan did not lessen the insistence of Mayor LaGuardia that a bigger cut in electric rates should be made. Commenting on the 7 per cent return, he said: "It's a monopoly and there's no risk involved. Seven per cent —that's 1890 talk."

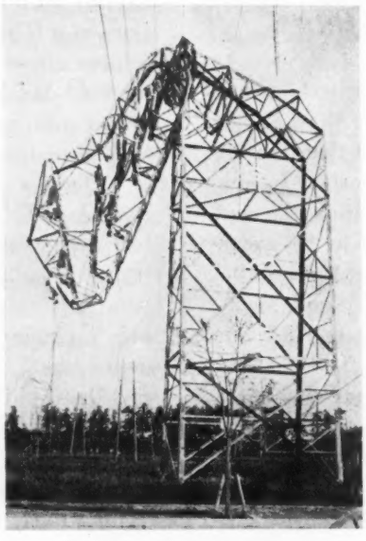
Another federal rate cut offered

Another offer was made by the Consolidated companies to the federal government of a reduction of $140,000, or 30 per cent, in the annual bill paid by the government for the lighting of its buildings in New York. A previous offer of a 15 per cent cut was publicly rejected by the government. In Washington Secretary Morgenthau confirmed the fact that the second offer had been made, but he said that he had not yet examined it. It was sent, he said, to Rear Admiral R. E. Bakenhus, public works officer for the New York district, for study and recommendations.

Submetering ban requested

Last week the electric companies of the Consolidated Gas system, as a step toward rate reductions and the establishment of the Washington Plan, filed with the state commission a petition for approval of uniform rules and regulations prohibiting the submetering and resale of electricity throughout its territory. The petition pointed out that "the prevalence of the submetering and resale of electricity, in the Borough of Manhattan and to a limited and lesser extent in parts of the other territory supplied, has been and is a serious obstacle to rate reductions and a large factor in maintaining the present level of electric rates." The petition asked that the commission hold a public hearing upon the proposed changes and then prescribe the rules effective April 1.

TYPHOON WREAKS HAVOC



Transmission tower of the Ujigawa Electric Company, carrying two 110-kv. circuits, was distorted in this interesting manner when struck by the full force of the typhoon which recently swept over Japan, causing widespread destruction.

Utility Men Confer With President

Light and power executives discuss plan for selling appliances with aid of government credit — No more power authorities to be set up now

Representatives of the electric power industry attended a conference at the White House last week called at their request on possible co-operation between the government and power interests in selling electrical appliances in rural areas. The discussion revolved around the possibility of adapting on a nationwide scale an experimental program now under way in the Tennessee Valley. Besides President Roosevelt and other officials, those present included C. E. Groesbeck, chairman of the board of the Electric Bond & Share Co.; Wendell L. Willkie, president of the Commonwealth & Southern Corporation, and Harvey Couch, president of the Arkansas, Mississippi and Louisiana Power & Light companies. Officers present included Frank R. McNinch, chairman of the Federal Power Commission; Basil Manly, vice-chairman, and David E. Lilienthal of the T.V.A.

"We talked about the sale of electrical appliances on a nationwide scale as part of the rural electrification program and about the general utility problems, including holding company legislation. The conference was granted at the request of these utility representatives," Mr. McNinch stated. He said that the proposed co-operation with the government concerned only the sale of electrical appliances, and not extensions of electrical service into rural areas. "The questions dealt with were from a national standpoint," he added. "The discussions were encouraging, but there are many problems to be worked out. There was no agreement on any particular thing."

At a press conference held last week President Roosevelt told newspaper men that he does not plan to set up authorities similar to the T.V.A. in other sections at the present time. Mr. Roosevelt said that he might set up regional advisory power committees in different areas in the coming summer, but he emphasized that they would not represent a costly organization. He expressed hope that he could find experts who would serve without pay in helping to develop a future power program.

Rate Survey Report Issued by Federal Power Commission

Graphic picture of residential rates given by commission in preliminary report — 191 cities, constituting 49 per cent of all residential customers, covered in survey and ranked as to relative charges

First of the serial reports to Congress on the nation's electric residential rates has been made (dated February 3, 1935) by the Electric Rate Survey staff of the Federal Power Commission. It covers 191 cities of 50,000 or more population and thus embraces the facts for 49 per cent of the country's urban and rural consumers. For consumption of 15 kw.-hr. per month Cleveland and Columbus share the honors with the lowest charge of 60 cents. Cleveland also shows the lowest figures for 25 and 40 kw.-hr., $0.88 and $1.31 respectively. Tacoma's municipal plant has the lowest rates for the larger consumptions. Jacksonville's municipal plant charges $7 for 100 kw.-hr., whereas Tacoma's bill is $2.40. Yonkers reflects the highest charges for consumption of 250 ($15.85) and 500 ($28.25) kw.-hr. per month.

Survey is restricted

Restricting the discussion to cities of 50,000-100,000, they rank somewhat differently. The competitive Cleveland municipal and private plants in the suburban service and the Holyoke plant charge only $0.60 for 15 kw.-hr., while York, Pa., charges $1.66. For 100 kw.-hr. Madison, Wis., has the low rate of $2.73 and Mount Vernon and New Rochelle, N. Y., the high of $7.31. These same two New York cities also show the high of $28.81 for 500 kw.-hr., whereas the Springfield, Ill., municipal charges the lowest rate, $7.30.

All the information reported and charted is in the form of typical bills carefully chosen to cover the lowest schedule available for each magnitude of domestic use. The commission finds this to be the only feasible method of presenting the rate facts. The data are as of January 1, 1935, and all of it has been verified by correspondence with the reporting companies. In nearly one-third of the 191 cities residential reductions have been made during the six months the survey has been in progress. The commission estimates these reductions to amount to $5,640,000. Earlier reductions are of course also reflected by the report.

Utility companies commended

Appreciation is expressed for the general spirit of co-operation of the utilities in supplying and clarifying the data. The report carefully cautions against making invidious comparisons between communities without taking into account the local factors that may well justify differences in rate *levels*, some of which are beyond the control of the companies, although it feels it must deplore the complexity and enormously wide variety of rate *structures*. One hamlet of 27 people was found to have eleven different residential rates available. One company bills 58,000 residential customers under 530 different schedules.

Of the 20,000,000 residential consumers, approximately 13,350,000, it was found, were supplied with lighting and small appliance service only, using, as a rule, 15, 25, to 40 kw.-hr. The 5,310,000 who also have electric refrigerators used 100 to 150 kw.-hr. Only about 150,000, apparently, use electric current for cooking but not for refrigeration. Some 870,000 have both electric cooking ranges and refrigerators as well as small appliances, using 250 kw.-hr.; and the 320,000 who utilize electric current for water heating as well as cooking, refrigeration, lighting and small appliance service, average about 500 kw.-hr.

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Power Commission Charged With Suppression of Facts

American investors are entitled to the whole truth regarding the value of their holdings in utility securities, but the statements of the Administration's Power Commission give only half-truths and suppress important facts, according to a statement made recently by Dr. Hugh S. Magill, president of the American Federation of Utility Investors.

"The reason why the gilt-edge bonds of certain operating companies, legal investments for savings banks and insurance companies are higher in price," Dr. Magill said, "is due to the remarkable soundness of the utility industry, the unusual demand for high-class securities because of the lowered yield on government obligations and savings banks deposits and the fact that the nation-wide plan for government competition in the development of power has not actually been put into effect.

"Besides the bonds of the soundest utility companies, there are billions of dollars in utility common and preferred stocks held by investors in good faith. Actual government competition in developing power units would tend to wipe out these values entirely and seriously impair the value of the senior securities. . . .

"A decline of approximately 40 per cent in the market value of common stocks of sound public utility operating companies has resulted since October, 1932. This decrease, if applied to the five billion dollars of utility common stocks, represents a loss to investors of nearly two billion dollars. . . ."

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Suit to Probe All T.V.A. Plans

Court hearings in Alabama open to program in other states — Authority gives contract to Westinghouse

Documentary evidence laying a foundation for an attack on the constitutionality of the electrification program of the Tennessee Valley Authority was placed this week before Judge W. I. Grubb, hearing a petition for an injunction to halt the government agency's power development plans. Clashes between attorneys interrupted the procedure of reading documentary evidence into the record in support of the plea of a group of preferred-stock holders of the Alabama Power Company for an injunction to restrain the power program and application of "yardstick" rates in fourteen north Alabama cities and towns.

Judge Grubb denied a motion to limit the testimony and evidence to the Alabama Power Company contracts, opening to inquiry the authority's power program in other states. He issued a subpœna for the minutes of the Tennessee Valley Authority's meetings.

Counsel for fourteen Alabama towns moved to dissolve a temporary injunction recently issued by Judge Grubb restraining them from accepting funds from the P.W.A. or any other governmental agency to build competing distribution systems. Hearing was set for February 2.

Westinghouse gets T.V.A. contract

The authority, placing its first contracts for major electrical equipment, has awarded to the Westinghouse Electric & Manufacturing Company an order amounting to approximately $1,000,000 for two waterwheel generators and auxiliary equipment. The generators, each of 56,000 kva. capacity, will be installed in the Norris Dam power plant on the Clinch River.

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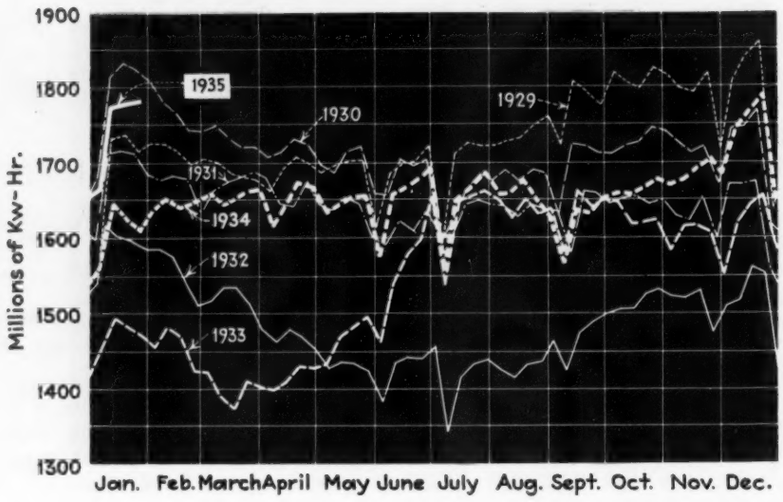
New Station for Pasadena

Construction of a new 12,000-kw. capacity substation and extensive installation of underground conduits are planned by the Pasadena, Calif., Municipal Light and Power Department as principal units in its 1935 program of extensions and betterments, according to C. W. Koiner, Pasadena city manager.

Output Still Forging Ahead



Reports of central-station energy output continue to indicate rising industrial activity, according to figures announced by the Edison Electric Institute. Instead of the usual decrease after the holidays production of 1,781,666,000 kw.-hr. in the week ended January 26 was almost up to the December peak. Since the beginning of the year each week has brought an increase. Abnormal weather may explain last week's rise, but it does not account for the sustained level.

The latest production figure is 10.6 per cent above last year's for the corresponding week, well above 1929 and all other years except 1930 and only 2.4 per cent under the all-time record for the fourth week in January.

All parts of the country participated in the advance, but the gain over 1934 in the Central industrial area is especially to be noted for it is piled on top of a 13 per cent increase last year over 1933.

Weekly Output, Millions of Kw.-Hr.

1935		1934		1933	
Jan. 26	1,782	Jan. 27	1,611	Jan. 28	1,470
Jan. 19	1,778	Jan. 20	1,625	Jan. 21	1,484
Jan. 12	1,773	Jan. 13	1,646	Jan. 14	1,495
Jan. 5	1,669	Jan. 6	1,564	Jan. 7	1,426
1934		1933		1932	
Dec. 29	1,650	Dec. 30	1,539	Dec. 31	1,415
Dec. 22	1,788	Dec. 23	1,657	Dec. 24	1,554

Per Cent Change from Previous Year

Region	Week ended Jan. 26	Jan. 19	Jan. 12
New England	+ 8.0	+ 6.4	+ 7.7
Middle Atlantic	+ 8.6	+ 7.1	+ 5.4
Central Industrial	+14.2	+11.9	+ 8.7
West Central	+ 7.4	+ 6.8	+ 4.1
Southern States	+10.3	+11.0	+ 9.4
Rocky Mountain	+13.6	+11.7	+12.0
Pacific Coast	+ 6.5	+ 5.8	+ 6.0
United States	+10 6	+ 9.4	+ 7.7

Allen of Westinghouse Predicts Business Revival

"Anticipating a revival of general business conditions, we are planning the most comprehensive advertising and promotion program for 1935 that Westinghouse has ever attempted," A. E. Allen, vice-president in charge of merchandising, told a group of editors and special news representatives recently at a luncheon held at the Waldorf-Astoria Hotel, New York. In explaining his optimistic prediction of an upward trend in business, the Westinghouse merchandising chief stated that 1934 had proved to be the biggest year in Westinghouse merchandising history, and that every indication pointed to an even greater stimulation in 1935. In justifying his faith in the continued progress of the electrical appliance industry, Mr. Allen said that Westinghouse merchandising had increased its 1934 sales 73 per cent over sales in 1933.

"Improved general business conditions, increased popular acceptance of electricity as a servant and a definite trend toward lower rate structures have all been responsible for the rebirth of the merchandising industry," Mr. Allen said.

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Electricity Commission Recommended for Quebec

Establishment of a commission which will be a central authority to which will be submitted the absolute and complete control of electricity in the Province of Quebec, both as to production and distribution, was recommended to the provincial government last week in the report of the commission appointed to investigate the electrical problem in Quebec. "The commission," the report says, "shall have all the powers necessary to see to the conditions of the sale of electrical service, to exercise its control of the accounts and books of companies and corporations, to supervise the financial operations, particularly the issue of capital stock and debentures, and the establishment of fair and reasonable rates."

As to municipalization, the commission declares itself in favor of the principle and recommends that the government adopt the legislation necessary to facilitate the creation of municipal electric systems, while protecting the autonomy of municipalities and the vested rights of the private interests already operating.

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Rare Merchandising Offers Made in Washington

J. Frank McLaughlin, president of the Puget Sound Power & Light Company, and J. D. Ross, superintendent of the Seattle Department of Lighting, on January 21 announced extraordinary merchandising offers which will benefit thousands of homes in Seattle and in western and eastern Washington.

The Puget Sound Light & Power Company is offering Hot Point electric ranges for $1.95 down payment and $1.95 a month and automatic water heaters with monel metal tanks for $2.35 down and $2.35 per month. The water heater is manufactured by the Edison General Electric Appliance Company. The City of Seattle Light Department is offering L. & H., Hotpoint or Westinghouse ranges at $1.75 down and $1.75 per month and water heaters for $2 down and $2 per month. The city of Seattle also announced the cost of wiring homes for electric ranges and heaters has also been reduced with savings as high as 50 per cent.

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Electrification Completed

Marking the completion of the electrification of the Pennsylvania trackage between New York and Washington, a special Pennsylvania Railroad train on Tuesday of this week made the round trip of 269 miles between Philadelphia and Washington in 3 hours and 54½ minutes running time. It broke the record for passenger trains both ways. The nine-car special, drawn by one of the road's new semi-streamlined electric engines, carried 128 persons, including railroad, state and federal officials, among these Secretary Ickes, whose Public Works Administration lent to the railroad $37,000,000 to complete the electrification.

New York Metal Prices

	Jan. 16, 1935 Cents per Pound	Jan. 30, 1935 Cents per Pound
Copper, electrolytic	9.00*	9.00*
Lead, Am. S. & R. Price	3.70	3.70
Antimony	14.25	14.25
Nickel ingot	35.00	35.00
Zinc, spot	4.10	4.05
Tin Straits	50.50	50.95
Aluminum, 99 per cent	19—21	19—21

*Blue Eagle.

Supreme Court Upholds Ohio Utility in Rate Cases

Reversing the decision of the Ohio Supreme Court, the United States Supreme Court recently held that orders of the state Public Service Commission fixing retroactive gas rates effective in Lima from 1928 to 1932 and in Kenton from 1929 to 1933 were in violation of the due process clause of the Fourteenth Amendment to the federal Constitution.

In the Lima case the highest court found errors in rejecting charges upon income. By adding to operating charges items erroneously excluded by the commission the Supreme Court found the prescribed rates to yield but 4.53 per cent, which "is too low to satisfy the requirements of the Constitution . . . when applied during the years 1928 to 1931." Since the sole method in Ohio for review of a commission order is by petition in error to the state Supreme Court, the record must exhibit facts relied upon by the court to repel unimpeached evidence submitted by the company in order to make such review adequate.

In the Kenton case action of the commission was held to be in violation of the due process clause of the Fourteenth Amendment where the commission, in ascertaining gross income and operating expenses, confined itself to the company's business in 1929 and predicted on that basis the income and expenses to be looked for in the years to follow, though there was evidence, full and unchallenged, as to the actual revenue and outlay for 1930 and 1931.

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United Corporation Report

In its annual report for 1934 the United Corporation shows the elimination of its demand loan, which totaled $5,000,000 at the end of 1933, and cash holdings of $1,980,673, against $950,896 a year before. Earned surplus at the close of 1934 stood at $11,145,550, compared with $8,590,761 at the end of 1933. Total investments carried at $582,965,026 on the books of the company had a market value on December 31, 1934, of $139,183,583, comparing with $586,498,081 and $188,249,626, respectively, at the end of the preceding year.

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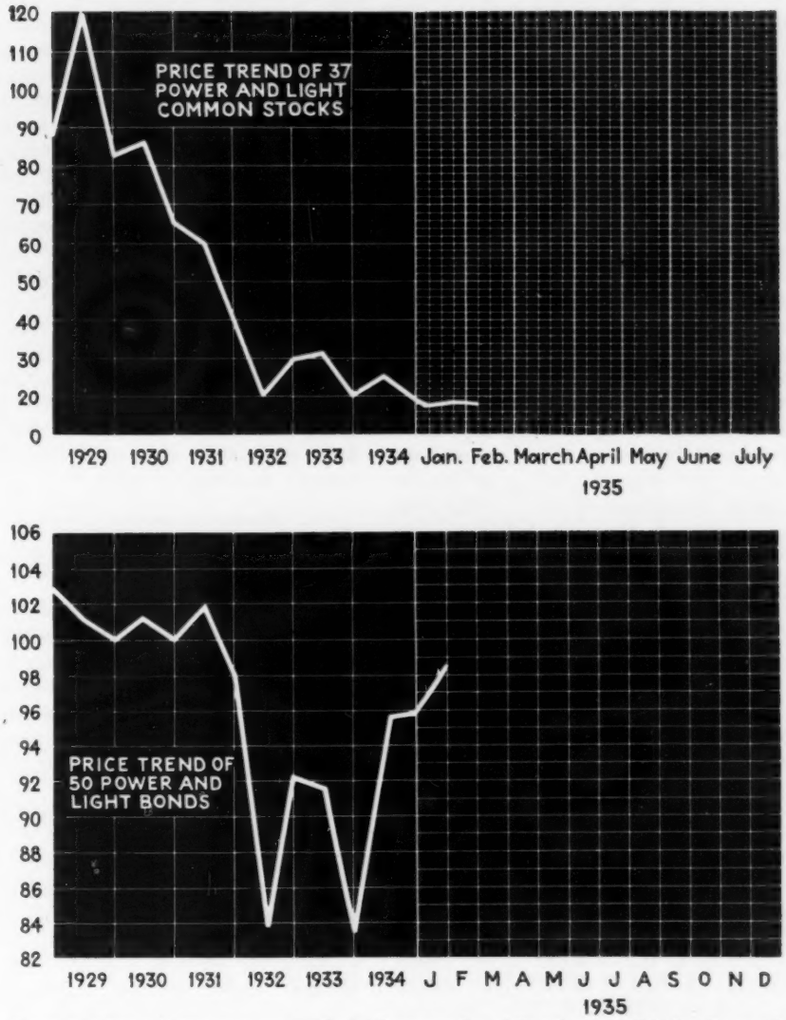
New Utility Plans Approved

At a hearing of stockholders and creditors of the Central Public Service Corporation, Central Gas & Electric Company, Southern Cities Public Utility Company and Southern Cities Public Service Company before the federal court in Maryland last week the court approved modifications to the plan of reorganization and the offer of compromise with the government on tax claims.

Utility Bonds Advance Sharply



Outstanding advances were made in January by utility issues, chiefly those of operating companies, which sold at new high levels since the low point of the depression. "Electrical World" index, 98.8; December, 95.9. Stock index unchanged at 18.5.

Securities Act Modified

Requirements for the registration of new issues under the securities act of 1933 have been made less onerous by the new form A-2 recently promulgated. The modifications mitigate impositions so burdensome that they stifled bond financing at a time corporations could take advantage of low interest rates for long-term periods. They are, according to Chairman Kennedy of the Securities Commission, the answer of that body to its pledge to make registration less onerous, less expensive and more practical. He estimated that there are at least $3,000,000,000 in security issues ready for refunding.

Maturities for 1935 in the electric light and power industry total only $127,981,000, as compared with $158,000,000 in 1934. Although these figures indicate that the obligations of the utilities are comparatively light in the current year, this change in registration requirements would seem to afford them a chance to go ahead, discharging, among other things, bank loans to which resort has had to be made as an expedient.

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Ten-Year Delay Asked On Utility Bond Maturity

Holders of first mortgage twenty-year sinking fund bonds of the Northwestern Electric Company due on May 1 next, of which $6,656,600 are in the hands of the public, are being asked to consent to an extension of maturity of the bonds to May 1, 1945. The company, which supplies electric energy to part of Portland, Ore., has announced that "there is no apparent prospect that the company will be able to provide funds to pay these bonds at their present maturity date, either through the sale of securities or otherwise."

Trade Board Submits Four-Point Plan

Report to Senate recommends drastic legislation for control of utility holding companies — Taxation and direct statutory prohibitions favored

Recommendations for legislation for the federal taxation and regulation of holding companies in the electric and gas utilities field were made by the Federal Trade Commission in its final report to the Senate. The commission laid down a four-point legislative program to correct the alleged evil practices of the holding company system. The program included (1) taxation; (2) direct statutory inhibitions; (3) a compulsory federal licensing act; (4) a permissive federal incorporation act. "The suggested methods are not conflicting," says the commission, adding that "any one, two, three, or all, may be employed." However, the report says that the commission "primarily recommends the first two methods—first, taxation, and, second, direct prohibitive legislation."

Dealing first with the taxation method of control, the commission laid down six tax proposals. The first was an annual tax, graduated sharply upward, on the net income to a holding company from the operation of its subsidiaries in states other than that in which the holding company is incorporated. An annual excise tax, sharply stepped upward as the amount increases, was also proposed, in proportion to the holdings by one utility holding, operating, or servicing corporation in another, or by any officer, or director of such corporation in another, or by any trustee or other person holding any such interest in any other utility holding, operating, supervising or servicing corporation. Other taxes outlined by the commission included levies on capital stock issues in excess of fixed capital, levies on transactions between interlocking corporations, taxes on gross income in excess of determined amounts, and taxes on authorized capitalization of any corporation which remains unissued.

Discussing the need for directly and specifically making unlawful certain practices, with proper penalties, the commission advises that a separate statute should be drawn making felonies or misdemeanors of certain abuses disclosed during the commission's public utilities investigation, so far as they may be reached under federal jurisdiction. It made, in all, 24 recommendations for legislation under this head, one point stressed being enforcement of the prudent investment theory in permitting security flotations.

Protection of rate payers

The next series of recommendations for statutory inhibitions would outlaw evils which the commission said affected the rate-paying public, such as the imposition by holding companies upon subsidiaries of contracts and arrangements which result in the compulsory and improper taking or diversion of operating company funds. The remaining recommendations in the group of 24 were classified as primarily for the protection of the investing public.

The final section of the report dealt with compulsory federal licensing and permissive federal incorporation, which the commission declared would provide a reasonably effective solution. One suggestion would prohibit transportation and sale in interstate commerce of electric energy and gas, or the issue of securities for their sale and transportation, by any utility holding or operating company unless a federal license is first obtained.

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Legislative Committee to Quiz New York Officials

The New York State joint legislative committee created to investigate activities of public utility corporations and affiliated organizations has authorized its counsel, John E. Mack, to send out an elaborate questionnaire to past and present state officials and members of the Legislature, asking them to detail all connections or transactions they have had with public utility companies during the past five years. The questionnaire is very complete and calls for information on stock or offices held in public utility companies and any compensation, fees, gifts, bonuses, dividends, stock reimbursements, campaign contributions or anything else which they might have received from any public utility company operating in the State of New York.

COMING MEETINGS

National Electrical Manufacturers Association—Midwinter conference, Waldorf-Astoria Hotel, New York City, February 6-8. W. J. Donald, 155 East 44th Street, New York.

Michigan Engineering Society—Annual meeting, Hotel Statler, Detroit, Mich., February 22-23. E. L. Brandt, executive secretary, 478 West Alexandrine Avenue, Detroit.

National Fire Protection Association—Electrical Committee, biennial meeting, Electrical Association of New York rooms, 46th Street and Lexington Avenue, New York, March 19-22. V. H. Tousley, secretary, Electrical Committee, 612 North Michigan Avenue, Chicago, Ill.

Electrochemical Society, Inc. — Spring meeting, New Orleans, La., March 21-23. Dr. Colin G. Fink, secretary, Columbia University, New York.

Missouri Association of Public Utilities—Annual meeting, Kansas City, Mo., April 25-26. Jesse Blythe, assistant secretary, 101 West High St., Jefferson City, Mo.

EVENTS IN WASHINGTON

Application has been made by the Great Western Power Company to the Federal Power Commission for a preliminary permit covering a project on the north fork of the Feather River. Six power developments are proposed. They are to utilize all of the available head between the existing Caribou and Big Bend developments. The power is to be used for public utility purposes in north and central California.

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Proposed amendments to the Reconstruction Finance Corporation's Act provide for a $300,000,000 fund for the financing of purchases of electrical, plumbing and air-conditioning appliances and equipment.

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Investigation of the government's land and water policies has been authorized by the Senate. It will be conducted by a special committee on which the public lands, irrigation and reclamation and agriculture and forestry committees are to be represented.

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The Federal Power Commission has concluded its hearings dealing with expenditures of the Lexington Water Power Company in connection with its Saluda project in North Carolina.

PAUL WOOTON,
Washington Correspondent.

Urges Government Continue Reclamation Policy

In a report based on a survey of federal reclamation in the West made by F. E. Schmitt, editor of *Engineering News-Record*, and John W. Haw, director of agricultural development, Northern Pacific Railway, the continuance of reclamation by the federal government as available means may permit was urged.

On the question of power produced in connection with reclamation projects, the committee reported that because of the wide diversity between projects in the relation of power to irrigation and the necessity of placing reclamation relations on a definite basis it is essential that a uniform policy be established by law. The committee made the suggestion that the farming enterprise and the power enterprise are independent activities and, to be sound, should each stand on its own feet. It also stated that power rates should be determined by consideration of the general public welfare and should not be used as a means of subsidizing a limited group.

Passamaquoddy Project Studied by Roosevelt

Further attention was given to the Passamaquoddy Bay project, Maine, last week when President Roosevelt and Dexter Cooper, engineer, conferred on an application to the Public Works Administration for a loan of $47,000,000 to finance the undertaking. The Passamaquoddy project involves not only a plant to harness the power of the tides of the Bay of Fundy, but to construct an aluminum and stainless-steel plant to provide a commercial outlook for such power. The only action taken by the P.W.A. on the application for aid in financing the work has consisted of the filing of a report on an investigation by engineers, who stated that the Passamaquoddy was feasible as an engineering project, but who expressed doubt whether it would be economically successful.

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Allis-Chalmers Company Holds "Open House"

Displaying a highly diversified line of equipment, the Allis-Chalmers Manufacturing Company was host at an "open house" on Saturday, January 19, to more than 30,000 guests who filed through the shops and foundries in Milwaukee on the invitation of Chairman Otto P. Falk and President Max Babb. Chief among the attractions were the 115,000-hp. hydro turbines for Boulder Dam, the 80,000-kw. steam turbo-unit to go into the Port Washington station of the Milwaukee Electric Railway & Light Company and the 2,000,000-volt surge laboratory. But this is not to say that Texrope drives, tractors, pumps and all the diverse products of the company did not each get their share of attention. They did. Officials pronounced the party a great success.

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Industrial Arts Exposition

Announcement has been made by the National Alliance of Art and Industry of an Industrial Arts Exposition to be held at Rockefeller Center Forum, New York, from April 15 to May 15. The purpose of the exposition is to demonstrate the improved living conditions among the lower income groups made possible by the accomplishments of American industry in the fields of housing, household appliances, transportation, communication, fabrication and leisure. Features of the exhibit will include a model of Frank Lloyd Wright's Broad Acre City and housing project models.

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Jackson Rejects City Plant

Jackson, Miss., voted down a proposal for municipal ownership of an electric power plant and a possible hookup with the Tennessee Valley Authority at an election held January 19 on a proposed $1,500,000 bond issue to finance the project. Complete returns show the vote stood at 3,888 to 3,098. Jackson has sought a reduction in electric rates amounting to 15 to 20 per cent, but the company contended that such a cut would amount to confiscation of property without due process of law. The company fought vigorously to defeat the bond issue, offering to put into effect, retroactive as of December 25, a compromise schedule of reduced electric rates previously rejected by the commission and also offering immediate substitution of a new bus system and a 5-cent fare for the present outworn street car system and a 7-cent fare.

•

Resources Board Urges National Network of Power

A vast public power development for the nation along the lines of the Tennessee Valley Authority was recommended to President Roosevelt recently by the water planning committee of the National Resources Board. "The combining of power generating facilities, where technically practicable with any type of dam (whether built for flood control, low power control, navigation or recreational purposes)," the report said, "may make economically feasible many a project which otherwise might not be so."

The committee estimated the total installed hydro-electric capacity of undeveloped sites at 55,000,000 kw., almost equal to the present developed capacity from all sources. Only locations promising profitable developments were considered, it added.

For the country as a whole, the committee advocated development of the "grid" system of connecting up electric transmission lines for power savings, adding that "in the interests of the national welfare there must be national control of all the running water in the United States." The report looked to extension of rural electrification "to an extent not as yet generally believed possible" as one outlet for new power.

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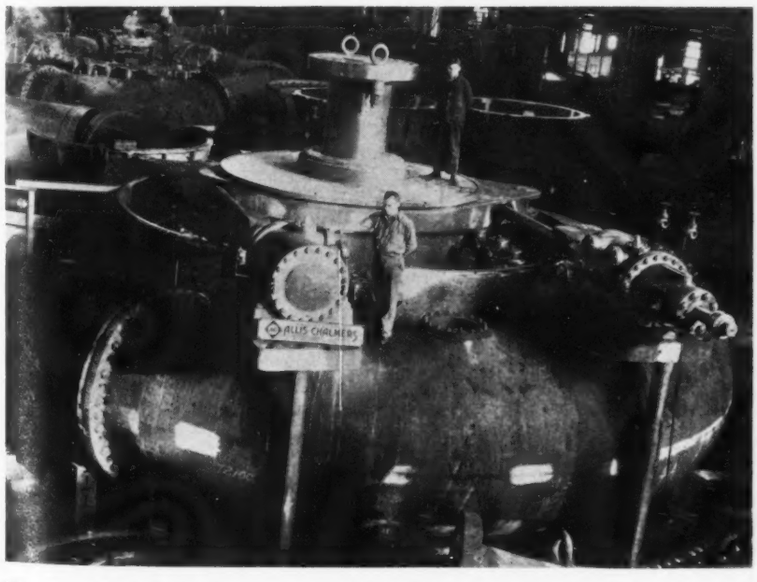
Columbus Project Delayed

On the application of the Columbus (Ohio) Railway, Power & Light Company, Federal Judge Benson W. Hough granted a ten-day restraining order to prevent the city from proceeding with plans for the construction of the $1,140,000 municipal electric light plant extension. The utility claims that the Public Works Act is unconstitutional and that the federal government has no constitutional right to furnish money to a city to expand a light plant in competition with private business. Hearing to argue on the application for a temporary injunction and the city's motion to dismiss has been set for February 2.

BOULDER DAM HYDRAULIC TURBINES



The four largest and most powerful turbines ever built, all for Boulder Dam, are now in the course of construction in the erecting shop of the Allis-Chalmers Manufacturing Company. Each of these turbines is capable of developing 150,000 hp. when the water in the reservoir reaches a maximum head of 592 ft.

Government Ownership Poor Cure for Errors, Willkie Asserts

In debate with Lilienthal before the Economic Club of New York, Commonwealth & Southern head says T.V.A. is guilty of practices charged against utilities — Holding companies hit by Lilienthal

"If abuses did occur in the electric utility industry, government operation gives no guarantee of their eradication," Wendell L. Willkie, president of the Commonwealth & Southern Corporation, said at a recent dinner of the Economic Club of New York, addressed also by T.V.A. Director Lilienthal. In support of his contention, Mr. Willkie enumerated several deadly parallels between the accusations against the utilities and the current practices of governmental agencies, especially the Tennessee Valley Authority. Avoidance of regulation by holding companies is matched, if not exceeded, by the T.V.A. declaration of independence of the Alabama and Tennessee commissions and of the Federal Power Commission.

Propaganda about T.V.A. has already attained a magnitude far surpassing anything ever perpetrated by utilities. Selling government securities against overbuilt capacities on the Tennessee is in a class with the error of Insull in patriotically investing money in capacity so as to ward off the depression when it became a real threat in 1930.

The government has even outdone the utilities in engaging professors. Incorporation in Delaware, where "limited" is an uncommon cognomen, has been common for holding companies, but E.H.F.A. also sought its corporate powers there. T.V.A. has been equally guilty of "write-ups" in shifting to the taxpayers' shoulders the burden of supporting flood control and navigation—mere bookkeeping jugglery. Likewise, T.V.A., through E.H.F.A., "out-Heroded Herod" in halving the margin which keeps the small retail dealer in business. Mr. Willkie called T.V.A.'s prototype, the Ontario Commission, a super-power company with an indebtedness equal to 40 per cent of the total provincial debt, the liabilities exceed $500 per electric customer, and he asked whether this was the much-heralded freedom from "interest slavery." Reducing the Ontario rates to exact comparability, he finds those of the Commonwealth & Southern properties to be substantially lower.

Lilienthal hits holding companies

Bondholders suffer when holding companies respond to the inescapable pressure to squeeze all they can from operating companies, said Mr. Lilienthal, because the result, in effect, is a confiscation of some of the value behind the bonds. In his opinion the Federal Trade Commission report casts a strong doubt on the existence of any equity for the great majority of utility common stocks. It may, he said, become necessary to defer dividends on them until that equity can be restored and the requisite cushion provided for the senior securities. In contrast with his comment on holding companies in general, the T.V.A. director paid a glowing tribute to the competency of management of operating utilities.

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Campaign Progresses for Better Light—Better Sight

A recent check-up in the progress of the Better Light—Better Sight campaign indicates that in 90 per cent of the cities of the country, with a population of over 10,000, some kind of a Better Light—Better Sight activity has been carried on during the past year. About 85 per cent of the privately owned electric utilities have organized eyesight conservation programs, also a considerable number of municipal plants.

Power company personnel now devoting time to Science of Seeing work in homes, stores and factories numbers more than 5,000, of which 2,500 have been added since last July. In the combined electrical, paint and optical industries it is estimated that 250,000 people are now actively or indirectly preaching this message. Some 48 Better Sight Bureaus have now been organized in cities. More than 5,000 meetings have been held throughout the country with a total attendance estimated at well over 350,000.

This progress in the movement was reported by Chairman M. E. Skinner of the National Better Light—Better Sight Bureau to a meeting held in New York on Tuesday. All aspects of the program were discussed by a variety of speakers. Since July, when the manufacture of I.E.S. certified portable lamps commenced, Mr. Skinner said, over 315,000 of these study reading lamps had been sold and it is predicted that a million more will be sold this year.

More than 20,000 sight meters of various types are now in use and are being sold at the rate of 1,000 a month. About 3,000 lighting kits and demonstrators have been sold by three manufacturers.

No definite figures are available as to the amount of improvement which has been achieved in lighting. The committee plans to make a survey of the country in March to secure data on the accomplishment to date. The work up to now has been directed principally to the development of home lighting and a national campaign in the commercial and industrial field was announced to be launched on February 1.

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Blue Eagles Withdrawn From 19 Lamp Companies

Blue Eagles of nineteen members of the Portable Lamp and Shade Industry Code were withdrawn last week for failure to pay their proportionate costs of administering the code. The companies that have been ordered to surrender their Blue Eagles include some of the largest manufacturers in the United States, according to Michael Schwartz, national supervisor of the code. The action, he said, would have a far-reaching effect, inasmuch as public utilities and department stores have provisions in their own codes forbidding members to purchase products from companies not manufacturing under codes.

The International Association of Electrical Inspectors, it was revealed last week by the Electrical Bureau of New York, has formally requested D. A. Tutein, deputy administrator for the National Recovery Administration, to incorporate safety specifications in the supplementary code of the lamp and shade manufacturers. The bureau explained that the association, after repeatedly urging portable lamp manufacturers to observe reasonable safety requirements because of the tremendous hazard in poorly constructed portable lamps, found this their only recourse to action. In his letter to Mr. Tutein, W. J. Mahan, president of the association, specifically requested the NRA to require all lamps to conform to the safety standards of the Underwriters' Laboratories, since these standards are nationally recognized.

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Kearney Conference Held

The seventh annual sales conference of the James R. Kearney Corporation was held in St. Louis January 7-11. At the final banquet more than 300 were in attendance. The conference was quite optimistic about business prospects in the coming months.

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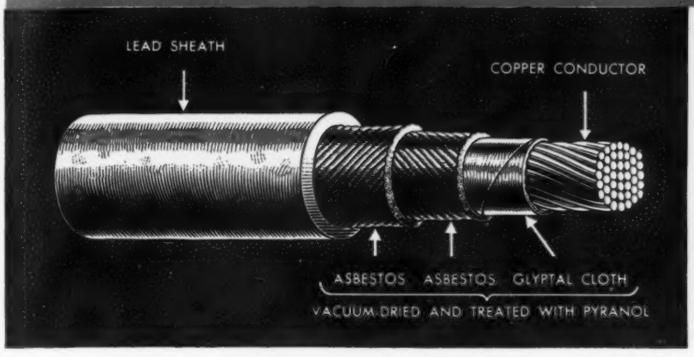
Municipal Plant Voted Down

Citizens of Eufaula, Okla., recently defeated by a vote of six to one a proposed bond issue of $125,000 to build a municipal electric light plant and build or purchase from the Oklahoma Gas & Electric Company the local distribution system. An application for a P.W.A. loan had been made.

WHICH TYPE CABLE for your NETWORKS and Other Secondary Circuits?



General Electric Offers 10 TYPES

*Three of them NEW

THE TEN TYPES

*Asbestos Glyptal, Leaded, Pyranol Treated

Consists of a layer of Glyptal cloth over the conductor and two layers of nonferrous asbestos. The cable is then vacuum-dried, treated with Pyranol, and leaded. It is flameproof, and insulation will not burn or give off explosive gases. (Illustrated above.)

*Paper, Leaded, Pyranol Treated

Identical with standard paper, leaded, oil-treated type, except that the paper is treated with Pyranol, which makes it flameproof.

Paper, Leaded, Oil-treated

This is standard paper-insulated leaded cable.

Varnished-cambric, Leaded

This is standard varnished-cambric-insulated leaded cable.

Glyptal Cloth, Leaded

Identical with standard varnished-cambric, except that the cloth is treated with a Glyptal varnish. It can be operated at a higher temperature, is more oil-resisting, tougher, and longer-lived.

Rubber, Leaded

This is standard rubber-insulated leaded cable.

Asbestos, Leaded

This is standard felted-asbestos-insulated leaded cable.

Rubber, Braided

The insulation on this type is a long-aging rubber compound with a moisture-absorption factor of only 0.015 gram per sq. in., a factor lower than that of any compound previously available. The finish is a special flame-resisting braid.

Rubber, All-rubber Sheath

The insulation is similar to that on the rubber braided type. The all-rubber sheath is nonhygroscopic, is tough and abrasion-, acid-, and alkali-resisting. Cable can be buried directly in ground.

*Rubber, Glyptal Sheath

Similar to all-rubber-sheath type, except that the sheath is made of the new Glyptal compound. This material, a new G-E development, is highly resistant to gasoline, oils, acids, and alkalies. Cable can also be buried directly in the ground.

THE type of cable which yesterday you considered best adapted for your networks and other secondary circuits may not be best today. Pyranol and Glyptal compounds, new rubber insulations, and other new developments have changed the picture.

Recognizing this situation, and the immense importance of secondary distribution circuits, General Electric has concentrated its research and development work on insulated cable for such applications. As a result, we are now able to offer ten types, one of which will surely meet your particular set of conditions. They are listed in the next column.

For more complete information about them, see our new publication, GEA-1885; or better, call in a G-E cable specialist. Address the nearest G-E sales office, or General Electric, Dept. 6A-201, Schenectady, N. Y.

MAIL FOR NEW BULLETIN

General Electric Company
Department 6A-201, Schenectady, N. Y.

Please send me a copy of your new publication GEA-1885 on network cable.

Name.....

Company.....

Address.....

520-26

GENERAL ELECTRIC

Notable Development Revealed at A.I.E.E. Convention

The broad scope and practical nature of the A.I.E.E. program, coupled with the new round-table conferences and opportunities for social enjoyment, attracted more than one thousand engineers from all over the country to the convention in New York City last week. Presentation of the Edison and John Fritz medals, a demonstrational lecture on "engineers' greatest gift to mankind" and fourteen inspection trips afforded other attractions. All of the 52 papers presented at the twelve parallel sessions had been published in advance, so that the business sessions were devoted almost entirely to discussions of the developments and practices presented.

Refreshing features of the convention included the increased attention given to timely problems, greater consideration of the dollar economics of engineering, as contrasted with efficiency and purely technical design, and developments that make for progress. Throughout, even the worst critics of the machine age would have to admit that service and benefits to mankind were always goals of the speakers, although they might be expressed in other terms.

There was something of interest and value to every electrical engineer, regardless of occupation. Particularly valuable were the papers on methods of securing more reliable transmissions and minimizing the effects of lightning; getting greater use of transformer investments by overloading during recurrent and emergency overloads; reducing noise from electrical equipment; solution of industrial processing problems with electronic tubes, testing induction motors, and major requirements of engineers that must be considered in their education. Experience with constant-current, high-voltage, direct-current transmission and unique motors and inverters (changing d.c. to a.c., or vice versa) dependent on electronic action were typical of developments that look into the future. The most significant comments raised in discussing all the foregoing subjects are presented on pages 23 to 27 of this issue.

In addition there were interesting sessions on electrical machinery, communication, cables, welding and illumination. Knowledge of oil and paper capacities and power factor were extended. Residual moisture was challenged as contributing to abnormal properties, and cannot be removed completely without losing desirable characteristics of paper. Increasing strand-to-strand contact was considered to prevent circulating currents that reduce carrying capacity. Development of a coaxial-conductor cable was announced, affording 200 communication channels at frequencies up to 1,000,000 cycles.

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British Output Increases

The total amount of electricity generated during 1934 by authorized undertakers in the United Kingdom was 15,459,000,000 units, compared with a revised figure of 13,562,000,000 units for 1933. This represents an increase of 14 per cent. During December 1,557,000,000 units were generated, an increase of 1.4 per cent over December, 1933.

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10 per Cent Gain Expected in Electrical Industry

In a statement made public last week Frank C. Jones, president of the National Electrical Manufacturers Association, said that the "electrical manufacturing industry may expect an improvement in business in 1935 as compared with 1934 ranging from 'next to nothing' up to 20 per cent, depending upon the chief line of products of each individual company. In general, the feeling among members of the executive committee of the National Electrical Manufacturers Association is that the industry may look for an average increase of 10 per cent."

Among the favorable factors cited by Mr. Jones were expansion of public works construction, more favorable outlook for industry generally and, therefore, for sales of electrical equipment to industry, the likelihood of a substantial movement toward rural electrification and the fact that utilities have to push the sale of household electrical appliances in order to build up a larger power load to offset declining rates. Also among the favorable factors was included the Federal Housing Administration stimulus to the market for electrical products, including not only homes but also office buildings and factories.

Among the adverse factors Mr. Jones cited the apparently adverse governmental attitude toward public utilities and the adverse effects of the attitude of business toward the securities act.

•

Utility Merchandise Men Meet at Nela Park

Utility merchandise managers believe 1935 will prove to be a record-breaking year for the sale of electrical appliances and the majority are setting up more ambitious sales programs than ever before, it was revealed at the Central Station Merchandise Managers' Conference held last month at the General Electric Institute, Cleveland.

P. B. Zimmerman, manager of G.E. specialty appliance sales department, in opening the meeting stated it was the policy of General Electric to give serious consideration to the problems encountered by the selling organizations of utilities. "We all feel," Mr. Zimmerman said, "that 1935 will start earlier and faster in the sale and distribution of electrical appliances than in previous years. . . ."

The meeting was attended by approximately 150 utility merchandisers and numerous General Electric sales heads.

McGraw Co-operation Medal to G. P. Buck

Formal presentation of the James H. McGraw Medal for Co-operation for 1934 was made to Gaylord P. Buck, general commercial manager of the Public Service Company of Colorado, at a dinner held in Denver on January 24. The citation read in part:

As president of the Rocky Mountain Electrical Association he saw the possibilities of creating a broader influence upon public opinion and developing a more intensive merchandising operation within the industry by co-ordinating the sales activities of electrical men throughout the entire area served by that organization. By his vigorous and stimulating leadership and the example of his own success in load building in Denver, he aroused the enthusiasm and the confidence of the industry and won their co-operation in a program of promotion and marketing to sell the electrical idea and increase the volume of the electrical business throughout the states of Colorado, New Mexico and Wyoming. . . . By the inspiration of his overwhelming enthusiasm he carried men along to an accomplishment that would have been impossible to unco-ordinated effort. Through his unflagging energy and zeal and his sound judgment and wise counsel he has

made himself the welcome and acknowledged leader in electrical development for this broad region and has established a spirit of devotion to a common progress that holds fine promise for continuing benefits. . . .

I-20

Any Housing You Want

—But above all an ACCURATE Watthour Meter

THE choice of housing for your watthour meters is, of course, important. To meet your requirements, the new G-E Type I-20 meters (I-20-A, I-20-B, I-20-C, and I-20-S) can be furnished in several styles of housings.

But more important than housing is the selection of the meter itself. Upon accurate registration depends your revenue — and therefore your profits; and we want you to consider the features which contribute toward making the I-20 meter exceptionally accurate under all conditions of service.

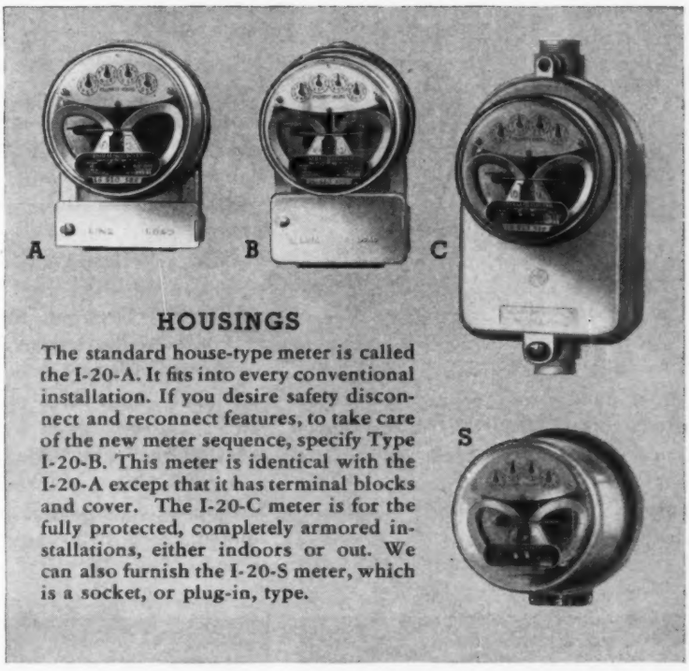
High torque, which insures accurate registration for long periods of time.

Long-range accuracy, which insures correct registration from light loads to the heavy loads taken by present-day residential consumers.

Independence of circuit conditions, which means that variation in voltage, frequency, and wave form do not affect performance.

Temperature compensation, which allows the meters to be installed anywhere, regardless of the most extreme variations in temperature, and still register with remarkable accuracy.

And of vast importance is the service record. The element in the I-20 meter is fundamentally the same as the element in our well-known I-16 meter, and the millions of I-16's in use, many for more than eight years, attest to the reliable and accurate performance of G-E watthour meters.



HOUSINGS

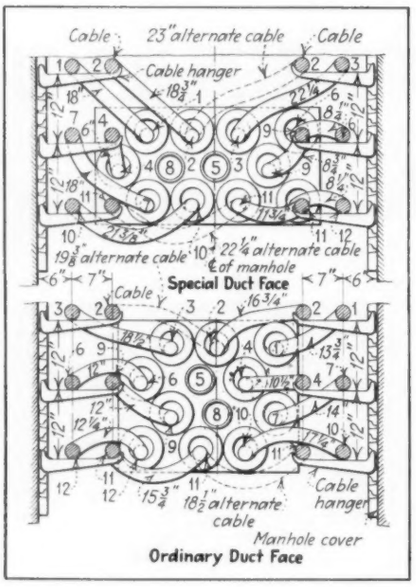
The standard house-type meter is called the I-20-A. It fits into every conventional installation. If you desire safety disconnect and reconnect features, to take care of the new meter sequence, specify Type I-20-B. This meter is identical with the I-20-A except that it has terminal blocks and cover. The I-20-C meter is for the fully protected, completely armored installations, either indoors or out. We can also furnish the I-20-S meter, which is a socket, or plug-in, type.

A new catalog on G-E watthour meters (GEA-615C) is soon to be issued. If you will address a request to the nearest G-E office, or to General Electric, Dept. 6E-201, Schenectady, N. Y., we shall be glad to send you a copy as soon as it is available.

400-6

GENERAL ELECTRIC

Systematic Racking of Manhole Cables



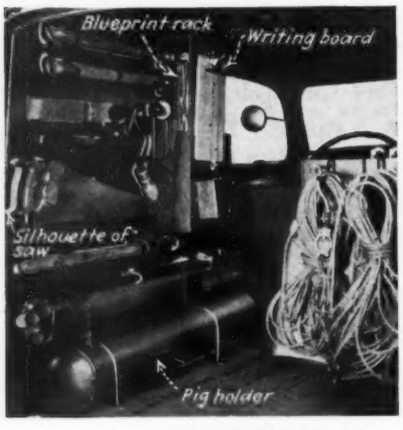
An inspection of manholes in many cities will disclose a surprising number of unnecessary complications due to unsightly and inaccessible arrangements of cables. Considering the fact that any repair work in a manhole must be done at high speed, systematic planning and designing is in order. The accompanying illustration shows two standard racking arrangements used by the Detroit Edison Company for twelve-duct manholes. In spite of the multiplicity of ducts the arrangement is simple because the arrangement of duct ends was designed with due regard to cable arrangement.

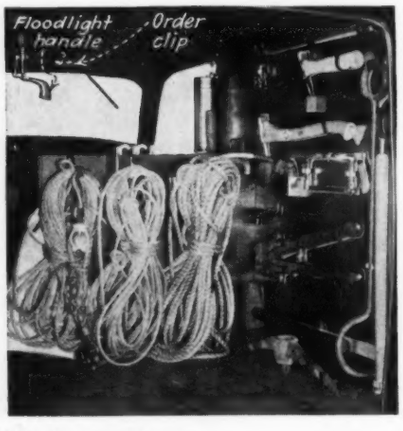
•

Improved Trouble-Trucks Adopted

A fleet of light gasoline trucks for trouble service on the distribution system is being fitted out by the Boston Edison Company. To save costs involved in standardizing on a specially designed truck, the company is utilizing the 1934 model of the Ford sedan delivery car. Several conveniences provided in the assembly of the fleet units at the company's general service buildings include: A radio aerial concealed in the truck roof and wired to appropriate terminals inside the body to facilitate the use of fault-locating apparatus without leaving the vehicle; an electric panel clock operated by the truck battery, and a new 50-cp. floodlighting unit designed by the Carpenter Manufacturing Company, South Boston, in which the reflector is rotated, raised or lowered by a special lever handle with pistol grip mounted above the driver's seat inside the truck, the reflector being at the center front of the roof. A writing board fits over the steering wheel without actuating the horn button.

All tools carried in these trucks are mounted on racks, hooks, etc., on the surface of whitewood panels upon which the silhouette of the tool is yellow-painted. This gives newly arrived maintenance men instant knowledge of tools in use regardless of the time of day and tends to speed up restoration of interrupted service. Supplies and tools are fastened in place so far as possible to avoid disorder in transit.





Trouble truck a model of convenience

Every tool and facility in a handy place of its own. Roof floodlights operated from driver's seat. Ladder carried on racks along left side of sedan-truck. Equipment for locating faults while in transit. Electric clock and writing board that fits over steering wheel.

•

Protect Equipment Against Immersion

Protection of underground transformers, circuit breakers and junction boxes against total immersion or damp atmosphere has required special consideration of suitable paints and gaskets. One company's chemist has outlined some requirements as follows:

"The paint employed must dry quickly in the humid, motionless atmosphere usually encountered in service, so it will have set before immersion. It should not be disintegrated by water or oil; the latter is frequently spilled on the cases. Gases injurious or irritating to human beings should not be emitted by the paint while it is being applied.

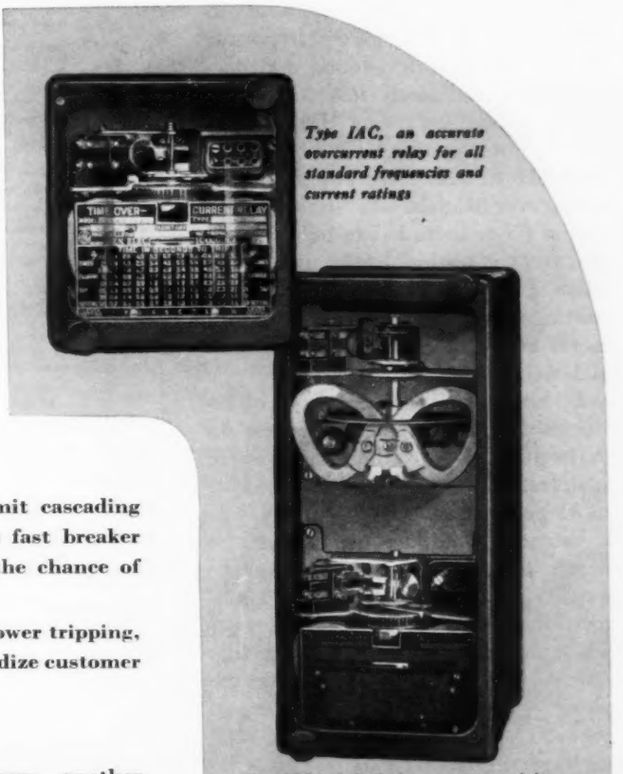
"Gaskets should resist water from the outside and oil from within. They should not soften and deform with heat."

So far this company reports only one paint that comes anywhere near meeting the requirements, but even that does not resist oil and requires the use of a gas mask when being applied, due to the benzol thinner. Various kinds of gaskets have been employed, but not with entire success; they include graphite impregnated fibrous material, oil-resistant materials and some of the newer products

RELAYS . . . . PROTECTION FOR YOUR SYSTEM INVESTMENT

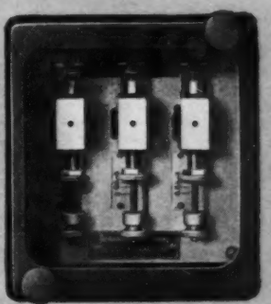
HOW You Can Reduce System Disturbances and Improve Customer Good Will ...INEXPENSIVELY

MANY system disturbances and power failures can be avoided by the use of these fast, accurate G-E overcurrent and directional relays. They are inexpensive, and the savings they will effect make them an investment that quickly pays for itself.



Type IAC, an accurate overcurrent relay for all standard frequencies and current ratings

Type IBC includes both overcurrent and directional elements



Type PYC instantaneous overcurrent relay gives high speed plus selectivity

Highly Accurate

Exceptionally accurate time-current characteristics permit cascading with extremely low time differentials. This assures the fast breaker tripping that sectionalizes faulty lines and minimizes the chance of faults getting through to the back-up breaker.

Less accurate relays require higher time settings, permit slower tripping, increase the possibility of unnecessary outages, and jeopardize customer good will.

Low Burdens

G-E relays impose low burdens on current transformers—another feature which increases accuracy, since current-transformer accuracy is inversely proportional to relay burden. All parts of the relays are accessible—inspection is made easy and maintenance costs are reduced.

Overcurrent and Directional-overcurrent Relays

The Type IAC relay provides time-delay overcurrent protection, while the Type IBC provides, in addition, a directional feature. Instantaneous tripping elements can be included in either of these relays.

Instantaneous Relay

The Type PYC will provide instantaneous tripping for your present overcurrent and directional-overcurrent relays. Accurate current indicators and attachments for tripping directly from current transformers are also available. For details write the nearest G-E office, or General Electric, Dept. 6-201, Schenectady, N. Y. Ask for Bulletins GEA-1314B, -86B, and -1997.

840-38

GENERAL ELECTRIC

that resist both oil and water. The latter, which have been tried, deform so much under the temperatures occurring that a tight seal is difficult.

Doubtless many companies are interested in a practical solution of these two problems.

•

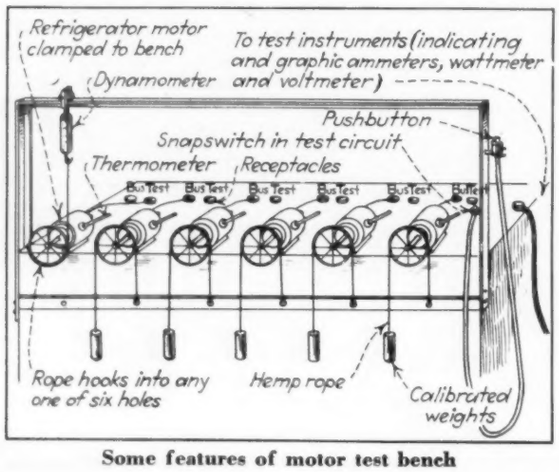
Simplifies Tests of Motors

Industrial and utility organizations that undertake to repair refrigerator motors have doubtless found it a time-consuming and costly task to test the motors before returning them to the users. For example, if a new motor costs $15 to $20, there is liable to be customer dissatisfaction if the repair cost of $5 or more has to be increased $2 to cover testing. Still, individual tests of motors for starting torque, starting current, pull-out torque, power factor and operating temperature cost at least this amount.

By an ingenious combination of facilities that permit one man to test six to twelve motors a day the cost of such tests has been reduced to 50 cents to $1 per motor by one company.

Essentially the facilities consist of a bench to which six motors can be quickly attached and fitted with a pulley for rope-brake and torque tests while instruments are switched into circuit for reading starting current, power factor, etc. Two diameters of grooved pulleys (12 in. and 18 in.), each provided in two shaft sizes ($\frac{1}{2}$ and $\frac{5}{8}$ in. for 12-in. and $\frac{3}{4}$ and 1 in. for 18-in. pulleys), are available for ready attachment to the motor shafts. For use in conjunction with these pulleys and their rope brakes a variety of lead weights are provided and labeled with the motor horsepower, r.p.m. and pulley size with which they are to be used to produce a 150 per cent load test. The brakes consist of ordinary $\frac{3}{8}$-in. hemp rope, which does not grab and which withstands at least 500 complete tests lasting as much as three hours per motor to cover temperature test. For the latter a thermometer is stuck on the outside of the motor with putty and a 10 deg. differential assumed between it and the hot spot.

Extending over the bench just above the pulleys is a rail on which travels a dynamometer with a rope which may be hooked into any one of six equispaced holes in the pulley rim for testing starting torque in various rotor positions. Used in conjunction with this is a portable push-button switch which energizes the motors and simultaneously connects the instruments for reading starting current and power factor. Receptacles back of each motor permit quick connection of any motor directly to the power bus for a heat run or indirectly thereto through a portable push-button switch and instruments, including indicating and graphic ammeters, wattmeter and voltmeter.

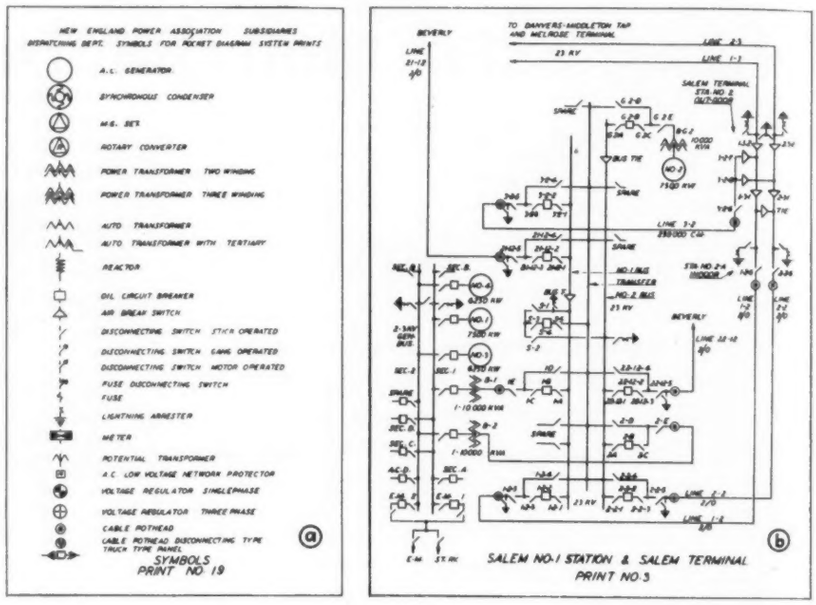


Some features of motor test bench

Compact Diagrams Standardized

Unusually condensed but complete one-line wiring diagrams, measuring $4\frac{1}{8}$x$6\frac{1}{4}$ in., are used to facilitate operation, maintenance and design work on the New England Power Association system. The originals are made up on 9x13-in. tracing cloth sheets by the load-dispatching department. Formerly reproduction by zinc etching was employed, but changes in the plates were too expensive. The present method utilizes the so-called photo-offset process, by which the original tracing is photographed to the final size desired and the contact print transferred to a sensitive metal plate which is used in the printing press. Changes which are made from time to time on the original tracing are readily effected on the plate.

The standard symbols adopted are shown, with a typical station diagram. Such drawings are unusually complete in detail, although the engineering department of the association maintains full wiring diagrams for all parts of the operated properties. The miniature prints are distributed according to local and staff usage to about 1,000 persons, including executives, engineers, operators and maintenance men, classification being colored by companies and regional groups of properties.



Samples of two sheets

The actual sheets measure $4\frac{1}{8}$x$6\frac{1}{4}$ in. and are punched at the top for holding in a binder or loose-leaf reference book. (a) Represents standard symbols used; (b) major electrical circuits of a specific station.

Saves Maintenance and Lubrication

By R. J. CORFIELD
Utah Copper Company, Garfield

To cut motor maintenance and lubricating costs and at the same time take advantage of the features of antifriction bearings, a program of conversion from sleeve to roller bearings

A 50-hp. motor with converted end bell and bearing

was started about six years ago and has shown rather remarkable results. Several features are involved in converting motors from one type to another, such as standardization of end bells and caps for various frames, determination of proper grade and quantity of lubricant, rigid machining and fitting practice and proper control of metal entering into castings.

Due to the fact that, up to this time, very little past experience was available on conversion jobs, and that every one was somewhat skeptical regarding the possibilities, it was decided to experiment with the toughest drive available. This happened to be a 50-hp., 900-r.p.m. motor, belt connected to an ore elevator, the average life of sleeve bearings on the driven end of this installation being six to eight weeks.

An end bell was designed which, together with the necessary caps and castings, made the converted motor appear as shown. This motor had been in service about six weeks when the drive-end bearing failed from what appeared to be poor fitting practice, as there was evidence of the bearing having turned in its housing. The whole assembly was taken down and checked for machine work and found in satisfactory condition.

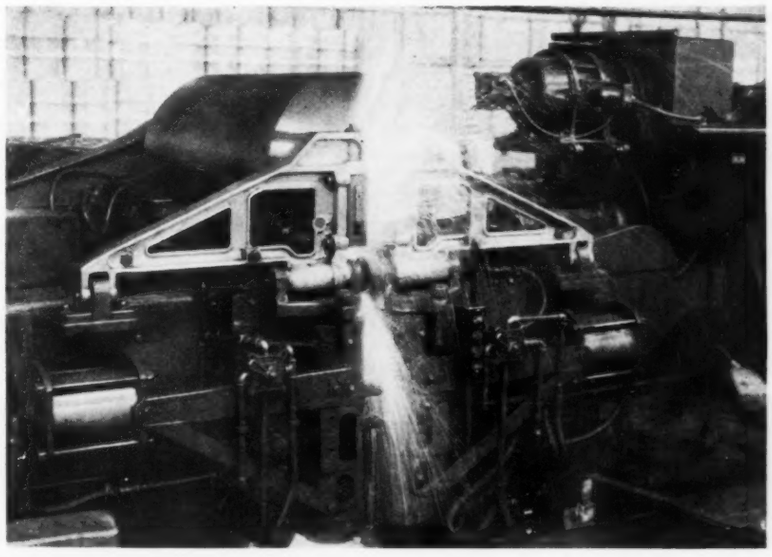
Attention was then given to the quality of the lubricant, and also the quantity. Tests on the particular lubricant used showed a decided "channeling" effect at ordinary temperatures and a tendency to turn to oil at higher temperatures. In an attempt to solve the lubricating problem almost every known grease was tried until the most satisfactory one was found.

Another lesson in end-bell design was learned when two end bells fractured at the hubs, due to excessive temperature. These drives were somewhat underrated and the high temperatures from stator and rotor were transmitted through the shaft to the bearing housings. Rather than change these intermittent drives, it was decided to re-enforce the hubs with rather heavy ribs. This proved satisfactory and has been carried out in all designs.

The conversion program involved approximately 300 motors, having an aggregate horsepower of 6,000. To date, ten bearing failures have been reported, nine of which were due to improper lubricant.

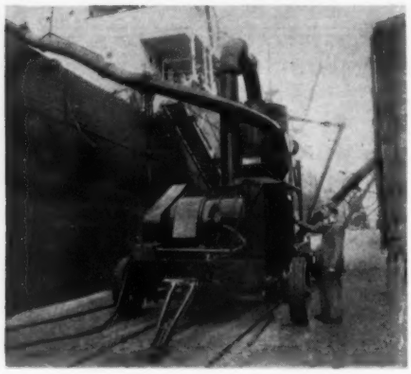
A large saving has been made in maintenance and lubricating costs. The services of two men who did nothing but oil motors has been made available for other work. Instead of daily inspection and oil replacement a semi-annual check-up of quantity of grease and general condition of motor is all that is required.

Automatic Welder Improves Production in Fabricating Plant



Replacing slow and expensive, manual methods of fabricating oil drums, the Boyle Manufacturing Company, Alameda, Calif., is using this modern a.c. automatic welding machine. It welds the longitudinal seam of cylindrical steel sheets at the rate of four a minute, faster and better than ever was possible under previous methods. Production has been increased not only because the automatic machine practically eliminates defective welds but also because its welds are better able to withstand subsequent pressing operations which establish ribs in the shaft of the drum to insure rigidity.

Bulk Cargoes Handled Quickly



Built especially for the purpose of transferring copra from the hold of a ship to a freight car as rapidly and as inexpensively as possible, this portable electric-driven unloader at Encinal Terminal, Oakland, Calif., will suck 45 tons of copra per hour out of the ship and blow it directly into the car. Two such equipments, each with a crew of three men, will unload a vessel in about one-tenth the time formerly required by hand-stevedoring methods.

The unloader, mounted on a heavy wheeled chassis so that it may be moved along the dock, consists of a 150-hp. motor-driven, positive-pressure blower, a hopper with a 5-hp. feeder motor in the base to prevent clogging and the necessary control equipment. Power is provided through a three-conductor cable from 440-volt power outlets spaced along the dock. The savings in demurrage and stevedoring costs suggest other applications.

•

Photo-Cell Solves Printing Problem

That standard electrical equipment will often solve industrial problems efficiently and inexpensively was demonstrated by a recent installation in a Utah printing plant. This company specializes in high-grade color printing and is justly proud of its reputation for fine work and excellent service. Plant operations occasionally were interrupted by the inaccuracy of the automatic feeder which fed the sheets of paper to the presses, the feeder sometimes sending two sheets to the press at one time. As the added thickness of the extra sheet of paper could throw the register out of adjustment and might possibly damage the engravings on the press, a delay, with the attendant increase in cost of the job, occurred whenever an extra sheet of paper got into the press.

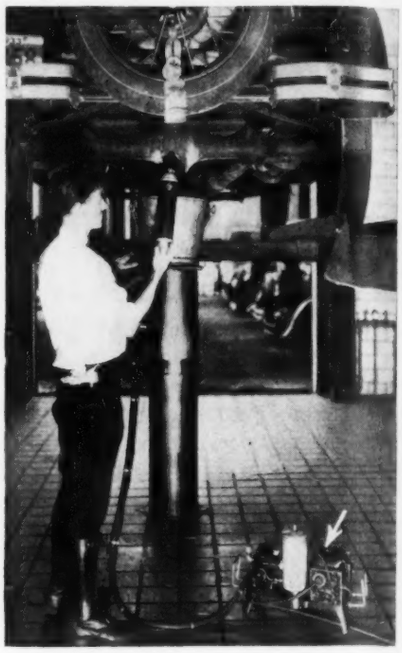
It was found that a photo-cell could be adjusted to operate on the variation in lighting passing through one or two thicknesses of the paper used on the presses. Consequently, a photo-cell and relay were installed so that the source of light for operating the cell was intercepted by the paper passing into the press. When more than one sheet of paper passes across the light path the photo-electric relay operates to stop the press before damage can occur.

•

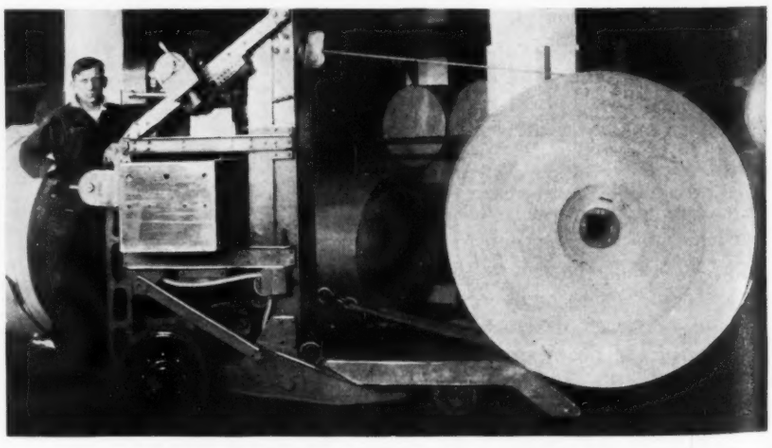
Mobile Handling of Heavy Loads

Striking progress has lately been achieved in the design of industrial electric trucks for handling heavy loads in constricted areas with extreme flexibility. In the case illustrated, a 2,135-lb. paper roll is allocated to its place in the stockroom by a single operator with the aid of a storage-battery truck equipped with a motor-driven hoist and low-hung steel platform with inclined apron, hooked belt and single cable release protecting the material from abrasion during loading or unloading. Maximum facility in lowering the load is insured by the control. The center of gravity of the truck is so far to the left of the small idler wheel under the load platform that it is impossible for the outfit to tip even when letting down the paper roll. The control enables the load to be taken on or released by slow and smooth stages.

Electric Heat Speeds Winter Servicing



Servicing operations which it would be almost impossible to perform without electric heat are done in a Cities Service Company's automobile service station in Cleveland. They are aided by a portable air compressor with 600 watts in strip heaters used to blow hot compressed air through a nozzle. This blower is used for a variety of purposes, chief among them being the thawing of frozen radiators, the easy draining of transmissions and differentials containing heavy greases and the loosening of shackles. This apparatus is perfectly safe to use on automobile motors, as the hot compressed air is moistureless and dirt-free.



Industrial truck discharging a 1-ton roll of paper

THE WAY *YOU* WOULD BUILD A STARTER

C-H 9586 "AAA" Starters for 5 h.p. and smaller motors

Set down the specifications for the perfect starter . . . Minimum contact troubles . . . Minimum heat rise . . . Protection of men and motors . . . No "false starts" . . . Simple, convenient . . . Low contact resistance . . . Low voltage drop . . . Utterly dependable . . . Can it be done? Check the C-H 9586 "AAA" against this list and see.

1. Heavy silver twin-break contacts render oxidation harmless. Operate on severest inching service at maximum h.p. Carry rated current with less than half permissible temperature rise.

2. Deep non-removable Thermoplax contact-pockets "soak-up" arc. No shields to misplace, no fragile parts. Contacts easily renewed; coils are readily changed. Only needed tool is screwdriver.

3. Twin-break contacts halve arc voltage.

4. C-H Overload Relay provides absolute protection . . . maximum production. Changes for current-rating and type of motor made simply by changing heater coil.

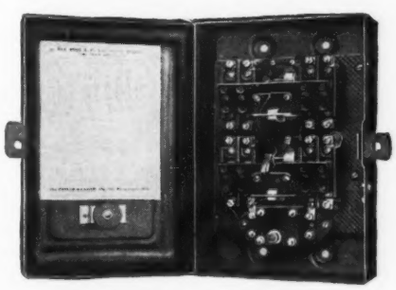
5. Designed to prevent contacts closing due to jarring, etc., until starter button is pushed.

6. 60 fewer parts. No pigtails to break. *Loosening* one screw dismounts entire control-panel. All parts easily accessible and demountable.

7. Convenient wiring channel between case and control panel. All leads brought in top or bottom.

8. Minimum of current-carrying joints. Low contact resistance. Low voltage drop.

9. Stocked by responsible independent electrical wholesalers everywhere.



"AAA" Performance in C-H Reversing Starters, too

The same ruggedness and certainty of C-H 9586 "AAA" Starters is brought to other types of C-H control through the use of the same mechanism . . . Picture shows Bul. 9595 Reversing Starter, vertical type. Also made in horizontal and back-to-back styles.

What is the verdict? Those twin-break silver-shod contacts, that structure based on heavy duty steel mill control design—these are the reasons for C-H 9586 "AAA" standardization in so many plants, typical reasons for C-H Motor Control Leadership. CUTLER-HAMMER, Inc., *Pioneer Manufacturers of Electric Control Apparatus,* 1285 St. Paul Ave., Milwaukee, Wis.

CUTLER HAMMER MOTOR CONTROL

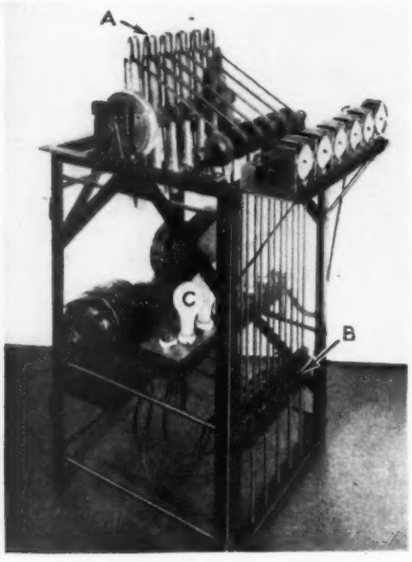
Starts, Stops, Regulates, Protects Industry's Motors

(B-255)

Vacuum Cleaner Cord Given Winding Test

By C. E. BOGER
The Hoover Company,
North Canton, Ohio

Cords for vacuum cleaners are subjected to deterioration from many windings on and off the hooks on the handle. A cord-winding apparatus is designed to wind and unwind a number of lengths of cord on handle sections in much the same manner as cord is wound on a cleaner handle during normal use. Sections of handles upon which the cord is repeatedly wound are built into the machine. Each cord is wound and unwound under a small tension (approximately the same as applied in normal service) which is supplied by steel blocks. During the test each section of cord conducts electrical energy (approximately the same as that required by a Hoover cleaner) to lamps mounted on a shelf near the driving motor.



Cords tested under current and under tension

A.—Sections of handle on which cords are wound and unwound by the apparatus; B.—steel blocks apply tension; C.—lamps supply load equivalent to cleaner.

Electric clocks are connected to each circuit which record the time of operation until a conductor fails by breaking, thereby stopping the clock. With knowledge of the time and cycles of operation for any time unit the winding cycles may be computed for any cord under test. This test subjects the conductors and insulation to fatigue and abuse and permits valuable comparisons of different lots and makes of cord.

•

Range Charts for Transformer Loading

By K. L. PARTRIDGE
Distribution Department,
Hartford Electric Light Company

A chart which has proved useful and reliably accurate has been devised to indicate requisite transformer capacity on circuits carrying ranges. In establishing it the ordinary base load per customer was assumed as 400 watts to cover all but ranges and water heaters. This, taking into account diversity and a maximum loading of 140 per cent permitted on transformers, fixes the base line marked "zero ranges" on the chart.

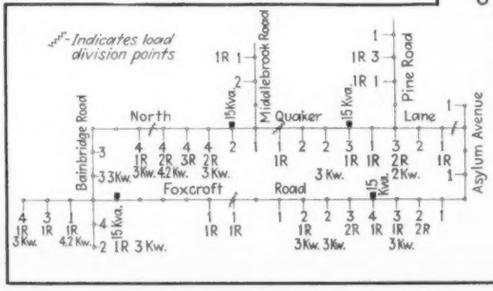
Demand produced by the connected ranges was then computed from such data as have appeared in reported range load surveys (*e.g.*, Winnipeg and Spokane). Again, these data take diversity into account, as shown by the progressively closer spacing of the oblique lines as ranges up to 20 are added. Field load checks have shown close agreement between the actual and calculated loads.

In dealing with interconnected secondaries like the example in the illustration a further step is necessary to assure proper location of transformers from the standpoint of capacity and regulation. Numbers of customers and of ranges at each service tap are entered on a span sketch of the secondary.

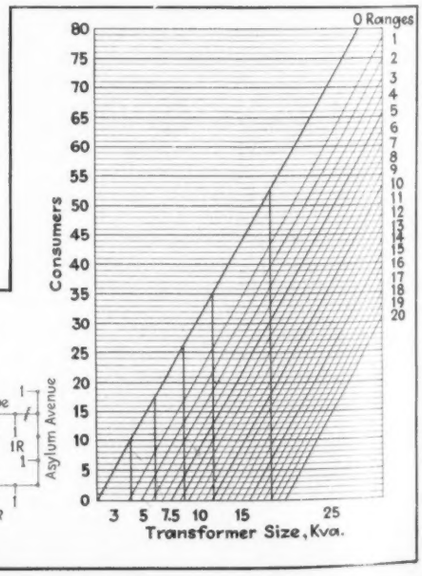
The loads are then figured as moments (load times spans) either side of each transformer and load division points thus found at places of equal total moments. If these desired equalities are not well met at points assumed to be the load boundaries of the respective transformers it is a simple matter of cut and try to determine whether to choose a better location for them or a better proportioning of their sizes.

All this is merely extra precaution as far as wire sizes are concerned, because Hartford has found little occasion to increase the wire sizes because of range additions, the change from 2,400 to 4,800 volts having provided a margin of capacity which has not been absorbed.

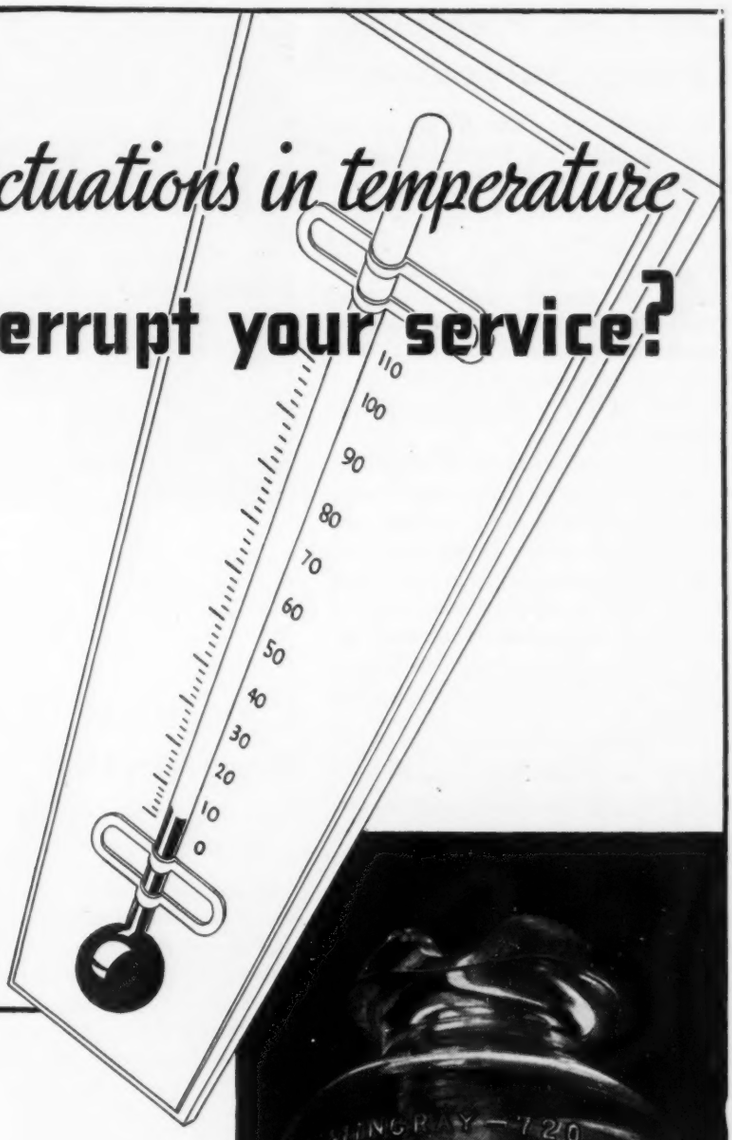
Moments used to check load division on secondary network

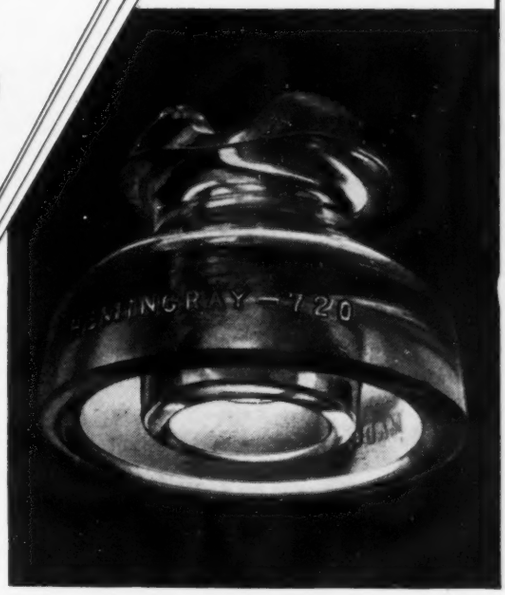


Transformer size indicated by the number of customers and ranges



Do seasonal fluctuations in temperature threaten to interrupt your service?





Hemingray Glass Insulators are unaffected by sudden or seasonal temperature changes

● If the temperature drops, you can protect your motor car by putting an anti-freeze solution into the radiator. But insulators must be made of a material that in itself withstands the shock and strain of severe temperature changes. You get this advantage when you rely on improved, tougher Hemingray Glass. Hemingray Insulators are homogeneous in character with only one coefficient of expansion. No aging or deterioration. Clear and flawless for easy inspection. All surfaces are impervious to moisture. A variety of styles in light green and golden brown is constantly available. Ratings up to 15,000 volts. Write us about your insulator requirements for primary and secondary power distribution. Owens-Illinois Glass Company . . . Hemingray Division . . . Muncie, Indiana.

Owlzed GLASS PRODUCTS

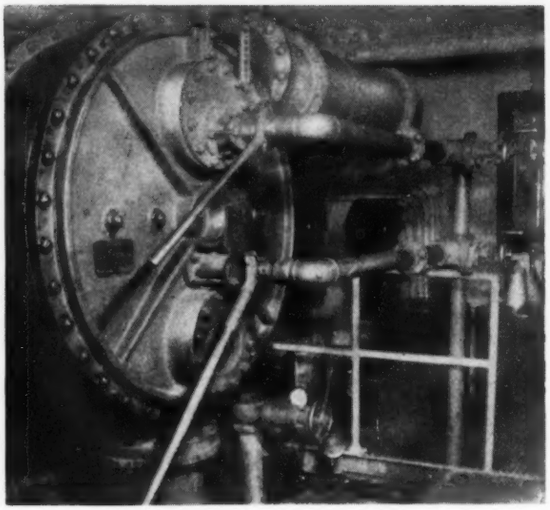
HEMINGRAY Glass INSULATORS

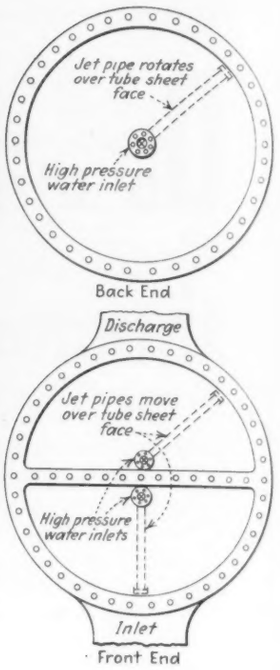
Low-Cost, Flexibility Feature Substation

In supplying 440-volt power for plant operations at the new plant of the Santa Cruz Portland Cement Company at Alameda, Calif., primary power is received via a lead-covered cable terminating at the plant substation. This substation consists of three single-phase transformers set upon a concrete foundation which has a 1-ft. gutter running longitudinally along the base of the primary side of the transformers.

In this gutter connections to the primaries are made in lead-covered cable and the leads carried up through concrete pedestals to the transformer terminals where wiped joints are installed. Making the primary connections in the manner described eliminated the need for any bus structure and insures trouble-free service barring cable breakdown.

Secondaries are brought out underground in individual lead-covered cables to a junction box located on one of the plant buildings where secondary connections are made. In case of transformer failure, the connections in the junction box quickly can be rearranged so that the bank may operate open delta with the damaged transformer cut out of the circuit, thus preventing a complete shutdown of the plant.





Two jets in head of condenser

To wash the condenser, the operator turns on the jets and by means of the handles shown swings them in a half circle over the face of the tube sheet. This is done frequently enough to prevent large accumulations in the tubes and while the condenser is in operation.

Condensers Washed; Removes Oily Wastes

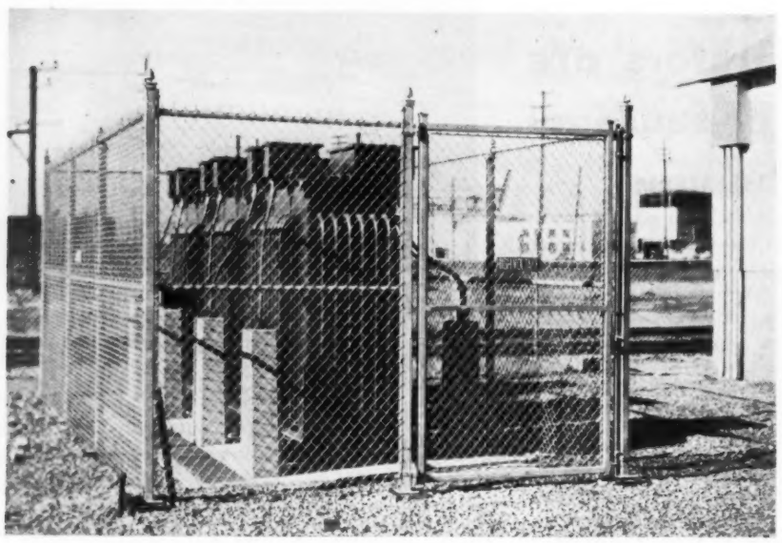
By R. A. FARIS
Superintendent
Mountain States Power Company,
Casper, Wyo.

Upstream a short distance from where the Casper station of the Mountain States Power Company takes its condensing water from the North Platte River is a large oil refinery. The river water carries enough oil so that the condenser tubes in the power station quickly become coated with it. The greasy deposit in the tubes is soft and easily removable, but it accumulates rapidly and must frequently be removed for efficient operation of the plant.

The condenser is of the double-pass horizontal type. Three multiple water jets were set into it, in the inlet and outlet chambers and in the back. The back plate of the condenser is drilled at its center for the admission of a water pipe which is carried through in a packed joint and is rotatable. By means of an elbow connection the water pipe is continued parallel to the plane of the condenser tube sheet. The pipe is capped at the end, but along that part of its length parallel to the tube sheet are drilled a number of holes facing the sheet. The effect is then that when the water pipe is turned externally the series of water jets plays over the face of the condenser tube sheet. The jets, being at considerably higher pressure than the water normally flowing through the condenser, enter the tubes and scour off the deposited oily slime.

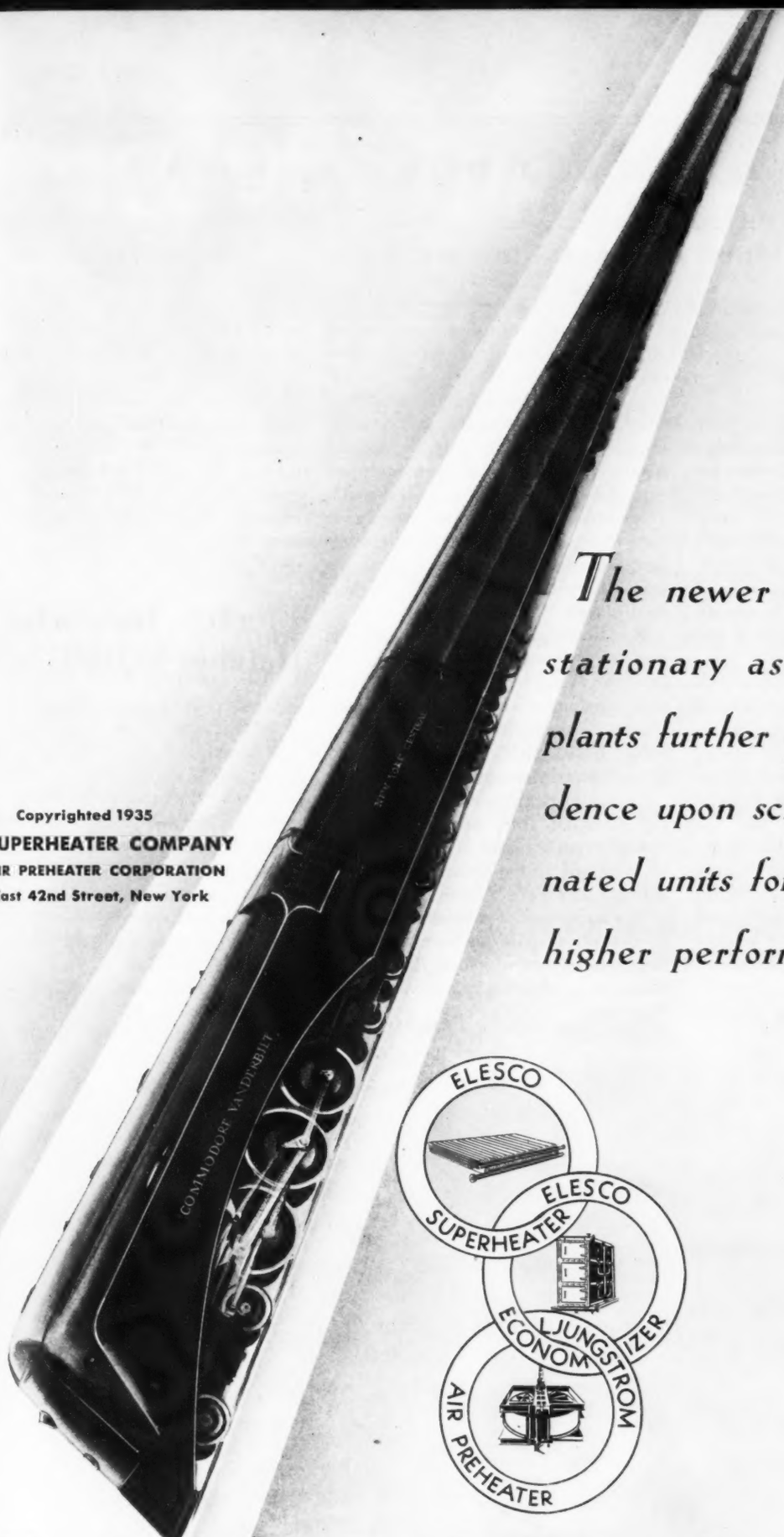
The same arrangement exists at the front of the condenser, except that here there are two jets, one in the intake and one in the discharge chambers. Also these jets are slightly off-center because of the horizontal dividing wall between inlet and discharge and each jet is movable through only a half-circle. As is to be expected, the cleaning action is better in the inlet than in the discharge chamber at the front of the condenser and is better in the tubes above than in those below the horizontal diameter of the tube sheet at the back.

Since the installation of these jets in the condenser the number of shutdowns for tube cleaning has been greatly decreased. Because of the fact that the jets are naturally more effective at the ends of the tubes it is still necessary for the condenser to be opened occasionally and the tubes cleaned in the good old-fashioned way.



Industrial substation has concrete gutter in base of foundation; primary connections made in lead-covered cables

Secondary leads are carried in individual cables to the junction box shown on the building (upper right) where connections are made, thus providing extra flexibility for the installation as the bank can easily be changed to operate in open delta in case of a transformer failure.



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THE SUPERHEATER COMPANY
THE AIR PREHEATER CORPORATION
60 East 42nd Street, New York

The newer achievements in stationary as well as motive plants further emphasize dependence upon scientifically coordinated units for establishment of higher performance standards.

A940

ELESCOORDINATED

SUPERHEATERS • AIR PREHEATERS • GRIFFIN HOT BLAST • WATER WALLS • ECONOMIZERS

BUILDING UP THE LOAD

APPLIANCES, LIGHTING AND POWER • DOMESTIC • COMMERCIAL • INDUSTRIAL

Defensive Methods in Power Sales

During the last four years as much as 70 per cent of power salesmen's time has been spent in hanging onto existing business, according to sales managers of several operating properties. Consequently defensive sales methods cannot be ignored in considering the maintenance or expansion of utility revenues, although it is encouraging to note that the epidemic of private plants is diminishing.

To provide its power salesmen with helpful data, one utility group checked up seven private plant installations which were reported to save money and found quite the reverse situation. One was dismantled. Another invested additional money to carry the low power-factor load. A third did not obtain the expected economies because of incorrect assumption of load factor. Two invested considerable additional capital because of insufficient reserve capacity. One was too far from utility lines. The last insisted on submetering at higher rates than purchasing power.

J. S. Hartt, consulting engineer, has analyzed* 89 municipal Diesel plants in Wisconsin, concluding that the average cost of energy purchased was substantially lower than that for energy generated in the municipal plants. If the latter had been equipped with sufficient capacity to give dependable service and proper allowance were made for maintenance the average unit cost of the municipal plants would have been substantially higher, he declared.

Day-by-day logs of one Diesel for five years, obtained by one utility company, are used by its salesmen, whenever customers believe competitive claims, to disprove the statement that units have little maintenance, no breakdowns, interruptions, etc.

Copies of engine-purchase contracts are collected from owners and furnished to utility salesmen so they will be informed on the nature of the competition they have to meet.

"Payments-out-of-savings contracts are largely promissory notes based on fictitious savings which do not include all costs or do not provide adequate reserve capacity," contends the sales manager of one large utility. Usually the claims are based on test block runs at 100 per cent load factor and not on actual conditions, he declares. The vulnerability of customers to such contracts is due to the fact that few understand accounting or are indifferent to expenses that should be on any balance sheet.

*ELECTRICAL WORLD, June 30, 1934, page 939.

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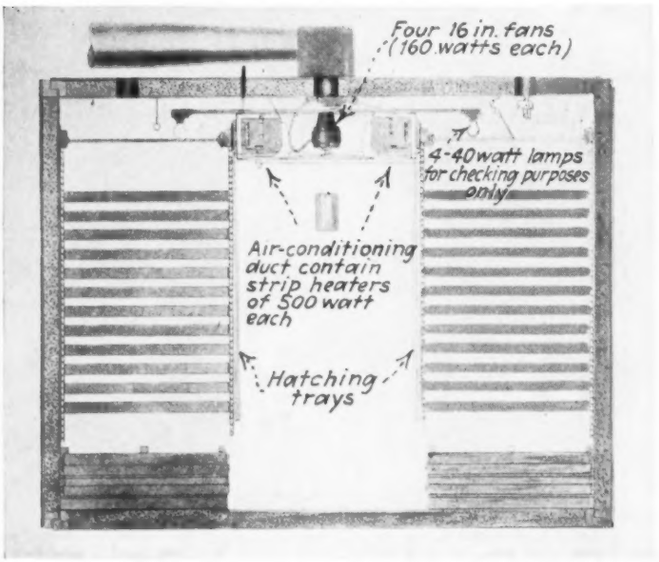
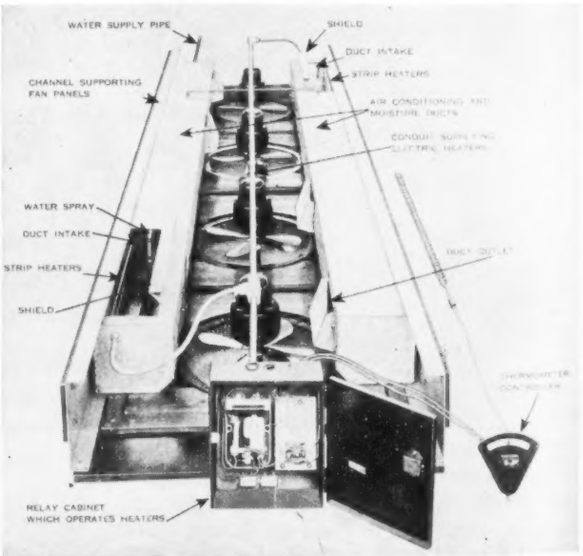
Electric Incubator Hatches 46,080 Chicks

Electric incubators with a capacity of 52,000 eggs which, with an 80 per cent hatch, produce about 46,080 chicks in 30 days, are used at the "Cook's Hatchery," Trenton, N. J. The normal consumption, according to G. A. Hess, power representative Public Service Electric & Gas Company, is 0.1121 kw.-hr. per month, or 0.0243 kw.-hr. per chick hatched.

The incubator, parts of which are shown, is rated at 20 amp. at 220 volts, but service is supplied at 240 volts. Attention is called to the air-conditioning ducts, in which are water


Four 16 in. fans (160 watts each)
4-40 watt lamps for checking purposes only
Air-conditioning duct contain strip heaters of 500 watt each
Hatching trays



Features of electric incubator

Air-conditioning ducts, containing water sprays and electric strip heaters controlled by thermometer and relays, coupled with ventilating fans are mounted near the ceiling of the incubator to maintain proper humidity and temperature.

LEVEL OUT THE LOAD CURVE THIS YEAR

HOTPOINT'S PLAN AIMS AT A CURVE LIKE THIS

ORDINARY LOAD CURVES APPEAR LIKE THIS

Every utility man realizes the great load-building potential of electric ranges and water heaters. Hotpoint's 1935 program provides for 12-month promotion.

Hotpoint's year 'round plan for building load quickly and progressively is meeting with enthusiastic response from utility men everywhere.

This comprehensive program adequately meets the need for adding profitable revenue every month. It covers five major activities with a complete campaign for each, including sales promotion and advertising material specially designed to support each period.

See this complete and timely program with Hotpoint's sales contests, advertising, sales promotion material, sales training and direct factory sales assistance. Hotpoint's experienced and capable District Managers, Range Specialists, Home Economists and Service Men are ready to help you in every way to increase your 1935 range business.

Spring Campaign now ready

Hotpoint's second major activity, the Spring Modernizing Campaign, is now ready for release. The Hotpoint District Representative in your territory will gladly present this material to you and go over the whole 1935 program for continuous load building.

We urge you to get in touch with him at once, so you may get the story early.

EDISON GENERAL ELECTRIC APPLIANCE CO., Inc.
5618 W. Taylor Street, Chicago

Hotpoint

ELECTRIC RANGES AND WATER HEATERS

★ ★ ★

CALROD—*Hotpoint's improved Hi-speed Calrod brings a new high standard to electric range performance. It combines remarkable speed with amazing durability.*

THE TREASURE — *One of Hotpoint's new 1935 ranges, with modern styling. Priced surprisingly low.*

sprays and electric heaters, the ventilating fans and the thermometer and relays controlling the heaters. The incubator was built by the Smith Incubator Company, Cleveland.

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Bridge Luncheons Snare Prospects

Initiating a novel plan to promote the sale of electric ranges, the Los Angeles Bureau of Power and Light has elected to act in the rôle of caterer for bridge luncheons in the homes of consumers who are electric range users. Housewives who own an electric range served by the bureau may repay social obligations without cost or effort through the new plan. All that is required is that the hostess invite either seven or eleven friends to luncheon on a day previously arranged for with the range sales section of the utility. Her responsibility ceases at this point.

All details of the luncheon are then arranged by the range sales section. All of the necessary bridge tables, dishes, linen, silverware and food are furnished. The menu is planned, the meal prepared, served, and the dishes washed—all by the staff of the Bureau of Power and Light. Immediately after the luncheon a member of the home economics staff gives a short talk on electric cookery and, a few days later, one of the bureau's salesmen makes a follow-up call on the hostess to obtain the names of those present.

Aside from being extremely popular with Los Angeles housewives, the plan is a sure fire means of developing prospects in electric cookery. Its cost is low in comparison to the potential new load that each luncheon develops.

To Attract and Hold Industrials

Kerr Atkinson of the consulting firm of Jackson & Moreland, says:

Industrial rates must be based on competitive costs of consumer generation if they are to attract and hold industrial business. Protection against risk of investment is the greatest single advantage of purchased power, because sinking funds for amortization and return on investment should be of major concern to industrial managements to avoid freezing capital in permanent physical form.

How to Safeguard ELECTRIC SERVICE in the Home
Observe these simple safety rules
1. NEVER RUN CORDS UNDER RUGS
2. DO NOT PLACE CORDS IN DOOR JAMS
3. CORDS SHOULD NEVER BE RUN OVER RADIATORS OR STEAM PIPES
4. NEVER LEAVE HEATING APPLIANCES CONNECTED WHEN NOT IN USE
5. DO NOT DISCONNECT APPLIANCES BY PULLING ON THE CORD
6. CORDS SHOULD NEVER BE USED AS A SUBSTITUTE FOR PERMANENT AND PROPERLY INSTALLED WIRING
7. CORDS SHOULD BE EXAMINED REGULARLY
8. INSIST ON APPROVED LABELED CORD WITH APPLIANCES, LAMPS and CORD ATTACHMENTS
UNDERWRITERS LABORATORIES INSP. CORD
9. BE SURE TO HAVE ALL ELECTRICAL REPAIRS AND WIRING MADE BY A COMPETENT ELECTRICAL CONTRACTOR
10. HAVE ALL WIRING INSPECTED BY AN ELECTRICAL INSPECTOR

The Electric Cord Manufacturers Group of N.E.M.A. is distributing this poster, a booklet and other material to promote safety in the use of domestic appliances. On the reverse is a "Home Inspection report" form. Power companies are distributing them.

Merchandising Home Electrification Idea

Taking advantage of the model all-steel, electrically equipped home constructed by the Palmer Steel Buildings, Inc., in Los Angeles, the Los Angeles Bureau of Power and Light prepared a handsome booklet on the all-electric home which was sent to its customers. Stressing both the safety of steel construction and the convenience of electrical appliances, the presentation has proved a powerful sales tool for greater domestic electrification.

Probably the most interesting portion of the booklet is the comparison in cost shown in the accompanying table between the conventional and the all-electric home.

The figure for cost of operation is carefully estimated for the Palmer house, assuming that it is lived in by the average family of three. The additional cost of the perfect, all-electric home is only $755.

The bureau not only is aggressively promoting the idea, but also is encouraging citizens of Los Angeles to electrify under the provisions of the National Housing Act. The compilation of costs shown above have proven an effective means of interesting prospects in greater electrical usage.

The Cost of Ordinary Equipment

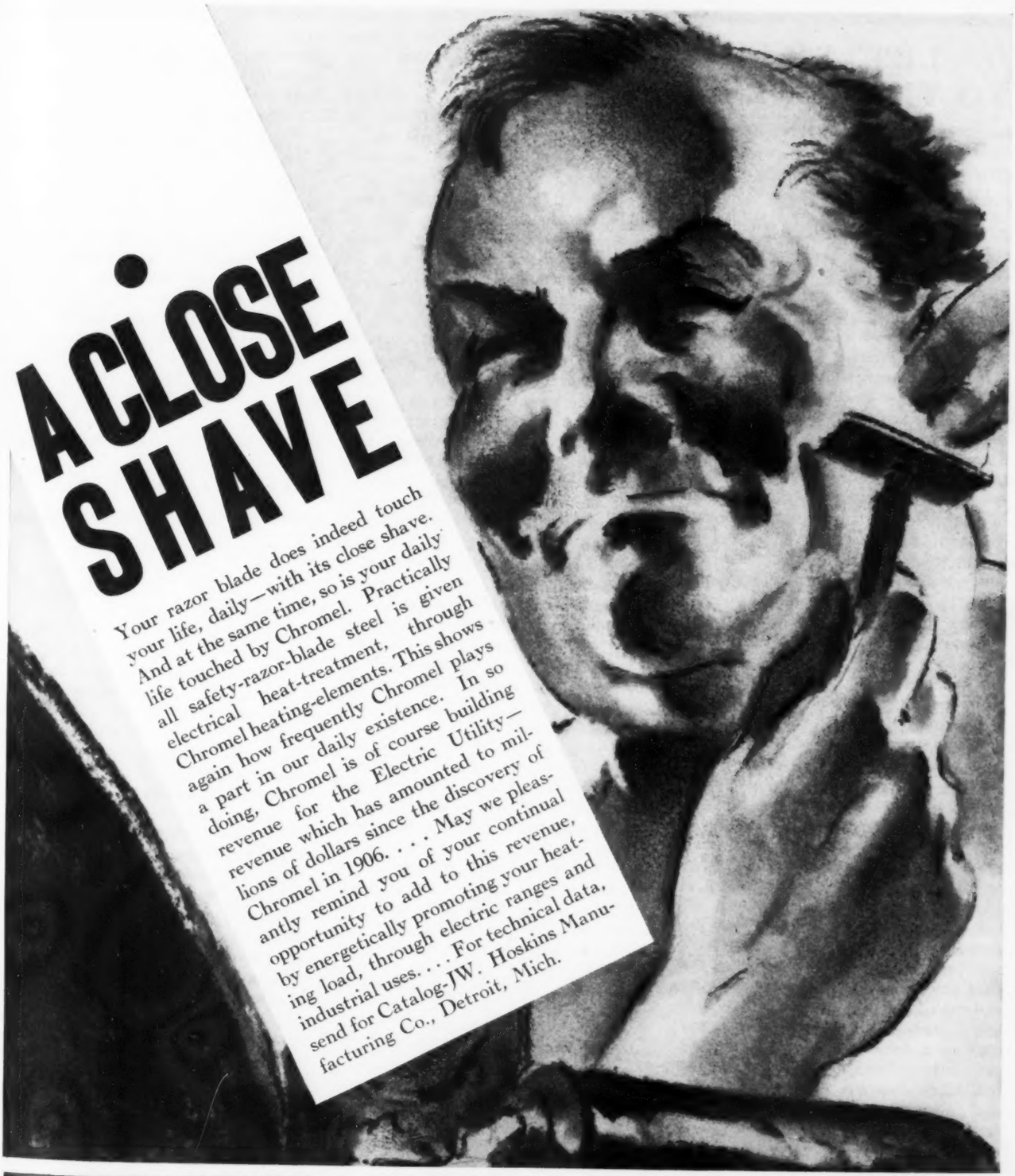
In building an ordinary house to be heated by a less modern method, there is the cost of cellar excavations and masonry	$150.00
A unit heat system for a home the size of the Palmer Steel House	250.00
An ordinary old-type water heater	50.00
A stove, lacking advantages of electric range	70.00
An electric refrigerator	150.00
An ordinary kitchen sink (without a dish washer), plumbing, tile, etc.	90.00
Ordinary wooden cabinets, instead of modern metal	90.00
An ordinary electric wiring job (fixtures not included)	90.00
Gas pipes and pipe fitting	50.00
Total cost of essential equipment in non-electric home	$990.00

The Purchase Cost and Operating Cost

of Electrical Equipment in the Palmer Steel House

Equipment	Purchase Cost	Annual Estimated Operating Cost at Bureau's New Rates
Electric Kitchen Including electric refrigerator, automatic electric range, monel metal sink with built-in dish washer, steel cabinets, automatic 40-gal. electric water heater, etc., including plumbing for sink and water heater	$1,385.00	$120.00
Air Heaters 12 kw. of air heaters	215.00	45.00
Lighting and Small Appliances Adequate modern illumination, plus radio and the usual small appliances such as toaster, waffle iron, etc.		35.00
Wiring The perfect wiring job for the entire home, with plenty of convenience outlets. (Fixtures not included)	177.50	
	$1,777.50	
Cost of Electrical Equipment And let us credit the cost of the wiring and installation of electric range and water heater, paid for by the Bureau of Power and Light, in single dwellings and duplexes on the Bureau lines, where service is not underground	32.50	
Net Cost of Electrical Equipment	$1,745.00	
***Estimated Total Yearly Cost of Electricity**		$200.00

*No other fuel bills to pay.



A CLOSE SHAVE

Your razor blade does indeed touch your life, daily—with its close shave. And at the same time, so is your daily life touched by Chromel. Practically all safety-razor-blade steel is given electrical heat-treatment, through Chromel heating-elements. This shows again how frequently Chromel plays a part in our daily existence. In so doing, Chromel is of course building revenue for the Electric Utility—revenue which has amounted to millions of dollars since the discovery of Chromel in 1906. . . . May we pleasantly remind you of your continual opportunity to add to this revenue, by energetically promoting your heating load, through electric ranges and industrial uses. . . . For technical data, send for Catalog-JW. Hoskins Manufacturing Co., Detroit, Mich.

HOSKINS

CHROMEL

WIRE

The Wire that made Electric Heat possible

LETTERS TO THE EDITOR

Ordinance-Making More at Fault Than Code

To the Editor of ELECTRICAL WORLD:

I have read with interest the interview of Earl Whitehorne with Louis H. Egan on wiring costs and naturally feel highly complimented, even though I do not wish to appear as the spokesman for the insurance interests.

It may, however, be appropriate to express my own opinion, and perhaps frank expression by all concerned is needed in order to set the example. There are two main branches of the industry—*i.e.*, generating current and manufacturing materials for the use of the current—both apparently competitive and non-cooperative in so far as wiring practice is concerned. The result of this inharmonious attitude divides the art of rule- and ordinance-making into two opposing camps; the utility group demanding that rules and ordinances should anticipate construction methods and the manufacturing group working on the principle that installation requirements should follow established practice in order not to disrupt manufacturing methods.

From the viewpoint of an inspector based on actual field experience of approximately 35 years, I should judge that a combination of both methods of rule-making, so interlocked as not to embarrass unnecessarily either group, is what we should strive to secure in the industry. In order to accomplish the purpose each side must naturally make some sacrifice, and this is where the shoe pinches. Man is inherently selfish, and even though he may not be too selfish as an individual, when he becomes part of a commercial organization the cumulative effect of the selfishness in individuals becomes a serious problem and altruistic leadership is quickly smothered in any individual because of economic necessity.

Associated with these two major groups we find the distributors, contractors and electrical mechanics, all looking through the glass at the reverse end with the result that only their activities are in the field of view. The result is that we do not have a national code of principles and our rules become industrial desideratums, the most influential groups securing the greater consideration. This is particularly true of electrical ordinances in which activities of certain groups in a major organization are not content to see municipal and state governments adopt a universal code, but strive to secure the adoption by these municipal and state governments of only sections of a code favoring their product or method.

I believe that the latter method of procedure and not the present code, indifferent as it probably appears, is mainly responsible for the increased cost of wiring methods. It is probably true that the National Electrical Code would profit by simplification, such as the co-ordination of rules in various articles and a better co-operation of the article committees.

Whether all commercial groups, no matter how closely associated, will be able through their combined efforts to co-ordinate the present rules or make new rules that will be of truly economic value to the users of current is a question, and until there can be arranged a set-up to place the current consumer in the pictures, we had better leave well enough alone. The present code does permit of inexpensive wiring systems and if universally adopted by states and municipalities should go a long way toward curing the evils of which Mr. Egan complains.

Perhaps Mr. Egan's analysis of the situation should be carefully considered by the electrical committee and, in order to make a thorough survey of wiring practices and the cost of each individual item in an electrical installation, should be analyzed.

It strikes me that the "interview" confuses municipal and state laws with National Electrical Code requirements. I do not wish to infer by this statement that the code does not need to be revised in some respects, as previously mentioned, but do not think that the blame for the cost of expensive wiring systems should be attributed solely to present code requirements.

GEO. WELMAN,
Chief Electrical Inspector
Louisiana Rating and Fire Prevention Bureau, New Orleans.

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Maintenance Information Wanted from Makers

To the Editor of ELECTRICAL WORLD:

One phase of the maintenance problem has given me considerable concern. In fact, I have pressed a number of manufacturers quite hard on this particular point. In general, they do not supply adequate information for properly taking care of some of their special equipment after it has been installed. If adequate instructions about adjustments, tolerances, special mechanisms, etc., are not furnished it is often difficult for the user to maintain the equipment at the standard of performance demanded of the utility.

With increasing complexity in some directions and enlarging reliance upon automatic means of keeping circuits energized with minimum interruption it is more than ever necessary for manufacturers to supply more details about the points to be observed in the upkeep of their devices.

GEORGE S. DIEHL,
Assistant to Superintendent of Operation, Pennsylvania Water & Power Company, Baltimore, Md.

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A Correction

In the article on "Pole Maintenance and Purchases" in ELECTRICAL WORLD for November 24 the totals of Table I were incorrect because of typographical errors due to last-minute additions. The totals should have been: Southern pine, 594,726; Western cedar, 1,836,694; chestnut, 667,081; other, 411,365, with a grand total of 3,509,896 poles.

BOOK REVIEWS

Electric Power Metering

By Archer E. Knowlton. Published by the McGraw-Hill Book Company, 330 West 42d Street, New York, N. Y. 333 pages, illustrated. Price, $4.

Electric Power Metering by Professor Knowlton is a comprehensive compilation of engineering information available on the subject of power and energy measurements. Although the detailed analysis of the methods of measuring power with indicating instruments and the theory and use of instrument transformers is a valuable part of the book, the real contribution will be found in the exhaustive treatment of all aspects of polyphase power measurements. The practical meter engineer will be particularly interested in the chapter on the verification of polyphase connections as well as the one on the accuracy of reactive metering.

No attempt has been made to indicate the superiority of any particular types of apparatus except with respect to its theoretical limitations. In many instances a few words indicating the practical difficulties which must be met in an attempt to make apparatus which will live up to the theoretical expectations would have been extremely interesting.

The historical material incorporated in the book is helpful in getting the picture of the various stages in the development of the art of energy measurement and the apparatus used. Some indication as to the extent to which the particular apparatus is now used would indicate the value of the development.

Professor Knowlton's long experience as a teacher is evident in the clarity of his vector diagrams and the facility with which he discusses the theoretical aspects of the apparatus involved. This, together with the subject matter, should make it particularly valuable as a textbook.

MEN OF THE INDUSTRY

R. M. Watt Named President of Kentucky Utility

Robert M. Watt, formerly executive vice-president of the Kentucky Utilities Company, Lexington, has been made president of that company to succeed Bryant White, resigned. Mr. Watt has been with the company in various capac-

R. M. Watt

ities since its organization in 1913. For several years he was in charge of its power operations in southeastern Kentucky with headquarters at Pineville. It was in 1931 that he assumed the duties of executive vice-president.

Following graduation from the University of North Carolina in 1909, he joined the engineering staff of the Commonwealth Edison Company in Chicago. In 1912 he went to Lexington to supervise construction of a generating station for the Kentucky Traction & Terminal Company and later rebuilt or modernized numerous power plants in small towns.

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▶ OWEN D. YOUNG, chairman of the board of the General Electric Company, was re-elected president of the Academy of Political Science at the fifty-fifth annual meeting of the trustees held last week.

▶ PHILIP L. WARREN, for the past five years a vice-president and director of Stone & Webster and Blodget, Inc., with headquarters in New York, has established offices in Boston, Mass., as a financial consultant with particular reference to public utilities.

▶ FREDERICK D. RICH, manager of the publicity relations department of the National Electrical Manufacturers' Association and editor of its weekly publication, *Nema News*, has resigned to reassume his duties as vice-president in charge of sales with Floherty & Staff, producers of dramatized illustrative photography, advertising ideas and illustrated industrial publicity, with headquarters in New York. Mr. Rich was called into Nema from Floherty & Staff in 1933 to set up the educational work to the manufacturers of the electrical industry with respect to their relations under the National Industrial Recovery Act and the basic code for the electrical manufacturing industry. He had previously been active in connection with organizing the NRA work in the New York City district.

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H. C. Leonard Made Manager of Louisiana Properties

H. C. Leonard, general superintendent of light and power of the El Paso Electric Company since 1930, has been promoted to the position of vice-president and general manager of the Gulf States Utilities Company, Louisiana division, with headquarters at Lake Charles. Mr. Leonard joined the Stone & Webster organization in 1919, being one of the group of engineers making an appraisal of the Virginia properties at the time they were taken over by Stone & Webster.

Upon completion of the appraisal Mr. Leonard went back to his native state, Massachusetts, returning later to the engineering department of the Virginia

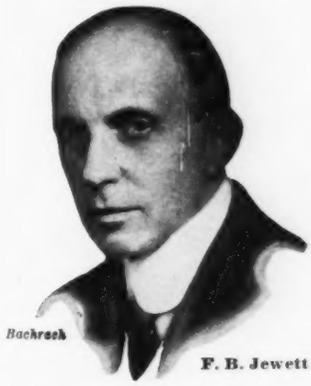
H. C. Leonard

Electric & Power Company at Norfolk. In 1927 he became head of that department, and in 1930 he was transferred to Richmond, in charge of the electrical department, remaining there until transferred to El Paso.

Born in Worcester, Mr. Leonard was graduated from the Worcester Polytechnic Institute and following graduation became identified with the General Electric Company.

Dr. Frank B. Jewett Awarded Faraday Medal

Dr. Frank B. Jewett, president of the Bell Telephone Laboratories and vice-president of the American Telephone & Telegraph Company, has been awarded the Faraday Medal by the council of the Institution of Electrical Engineers of



Bachrach

F. B. Jewett

Great Britain. A past-president of the American Institute of Electrical Engineers, Dr. Jewett has had a long and distinguished career as an electrical engineer.

A native of Pasadena, Calif., and a graduate of the Throop Polytechnic Institute (now the California Institute of Technology), he studied at the University of Chicago, where he received the degree of Ph.D. in 1902. From 1902 to 1904 he was an instructor in physics at the Massachusetts Institute of Technology. In 1904 he joined the staff of the American Telephone & Telegraph Company, taking charge of the engineering research work. From 1908 to 1912 Dr. Jewett was transmission and protection engineer. In 1912 he became assistant chief engineer of the Western Electric Company and in 1916 chief engineer, having charge of the research laboratories and all engineering in connection with Western Electric manufacturing. Six years later he was appointed vice-president of the Western Electric Company. He has been president of the Bell Telephone Laboratories since 1925.

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▶ JAMES T. HOLMES, chief engineer of the Frink Corporation for the past twenty years, has resigned.

▶ WALTER AYERS has been appointed sales manager of Electromaster, Inc., Detroit. Announcement of his promotion from the executive sales staff to supervision of the field force was made

by Gerald Hulett, vice-president of the company. For several years Mr. Ayers has been contacting public utility executives for Electromaster.

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Douglas Dow Joins "Electrical World" Staff

Douglas Dow, of the Detroit Edison Company, has joined the staff of ELECTRICAL WORLD to aid with the development and publication of the National Recovery Number of March 30. Mr. Dow has had an unusually diversified and intimate experience in electrical manufacturing

Douglas Dow

and in public utilities and is widely acquainted. His experience and talents will be invaluable in the development of an issue of such potential importance to the electrical industry.

After graduation from the University of Michigan in 1922, Mr. Dow spent four years with the General Electric Company, where he took the test and factory training courses, and later served on the factory staff. He then joined the staff of the Detroit Edison Company, where he has had experience in the purchasing, sales and control departments. He also served as commissioner of purchases and supplies as a member of the Mayor's Committee on Efficiency and Economy in Detroit. Since 1932, as an engineer on the controller's staff of the Detroit Edison Company, he has had an unusual opportunity to become experienced in all aspects of utility management. Mr. Dow is a member of many clubs and societies and has a great many friends and acquaintances in the industry to attest to his pleasing personality and ability. His counsel and aid in the production of the National Recovery Number of ELECTRICAL WORLD will be invaluable to the magazine and to the industry.

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▶ ROBERT W. MITCHELL, for the past four years general manager of the United Electric Light Company, Springfield, Mass., has been appointed assistant to the president. LEONARD J. PRESSON, assistant manager, has been promoted to the position of general manager and CHARLES P. GOLDING has been advanced from general sales manager to assistant manager. WILLIAM F. ROONEY, illuminating engineer, has been appointed general sales manager.

▶ S. V. TRAVIS has been appointed manager of the generator and converter division of the central station department of the General Electric Company to succeed the late G. F. Brown. Mr. Travis has been connected with the General Electric organization since 1911.

▶ E. E. BRAZIER, manager of the General Electric Supply Corporation at Denver, Colo., has been elected president of the Electrical League of Colorado.

▶ HAROLD HOBSON has been appointed general manager of the British Central Electricity Board to succeed Sir Archibald Page, who was appointed chairman of the board at the beginning of the year. For the past seven years Mr. Hobson has been commercial manager of the board and previously joint manager of the County of London Electricity Supply Company. Prior to that appointment he had spent ten years with Merz & McLellan, consulting engineers.

▶ A. J. SARRE, for the past ten years in direct charge of the industrial relations department of New Orleans Public Service, Inc., announces a new service to commercial and industrial interests, under his direct supervision and management through Personal Service Bureau, Inc., with headquarters in New Orleans. Mr. Sarré has been active on various committees of the National Electric Light Association, American Gas Association and American Transit Association.

▶ FRANK D. PEMBLETON has been appointed sales manager, electric, for the Public Service Electric & Gas Company, Newark, N. J. Mr. Pembleton's period of service with Public Service and predecessor companies dates from 1901, when he started in the new-business department at Newark. Later he was made assistant to the new-business agent and in 1927 became assistant to the vice-president in charge of sales. In 1931 he was appointed assistant general sales manager, electric.

▶ FRANCIS J. WALKER has been appointed sales manager of the Garfield Manufacturing Company, Garfield, N. J., manufacturer of molded composition. Mr. Walker has been for a number of years engaged in the molding industry. He was formerly in charge of sales for the Connecticut Molded Products Company, Meriden, Conn., and prior to that connection was supervisor of sales, molded insulation division, Economy Fuse & Manufacturing Company, Chicago.

OBITUARY

C. W. Hobson

Charles W. Hobson, for years president and general manager of the Southwest General Electric Company, a pioneer in the electric supply jobbing field and association work and an early organizer of utility companies, died, of a heart attack, at Dallas, Tex., January 22. Born in 1867 at Savannah, Mo.,

C. W. Hobson

he became treasurer of the first electric street railway in St. Joseph, Mo., at the early age of 21. Foreseeing development in the Southwest, he and his father went to Waco, Tex., and organized the Waco Street Railway in 1891, of which he became manager. Three years later, after contending with delays in getting supplies and construction materials from manufacturers, he conceived the value of a Southwestern supply warehouse and organized the Waco Electric Supply Company. In 1903 he moved his headquarters to Dallas, establishing branches in Houston, El Paso and Oklahoma City. His organization was purchased by the General Electric Company in 1912, when he was made executive and operating head of the Southwest General Electric Company. He retired in 1928.

During his active career Mr. Hobson, with J. F. Strickland, was instrumental in securing the first franchise of the Dallas Power & Light Company and Dallas Street Railway & Terminal Company. He was chairman of the board of the Dallas Railway Company from 1917 to 1926, a director of the Texas Electric Railway interurban lines and also of the National Bank of Dallas. About 1899 he and a newspaper man from Houston wrote the first ritual of the "Rejuvenated Sons of Jove"—a forerunner of the electrical leagues of this country.

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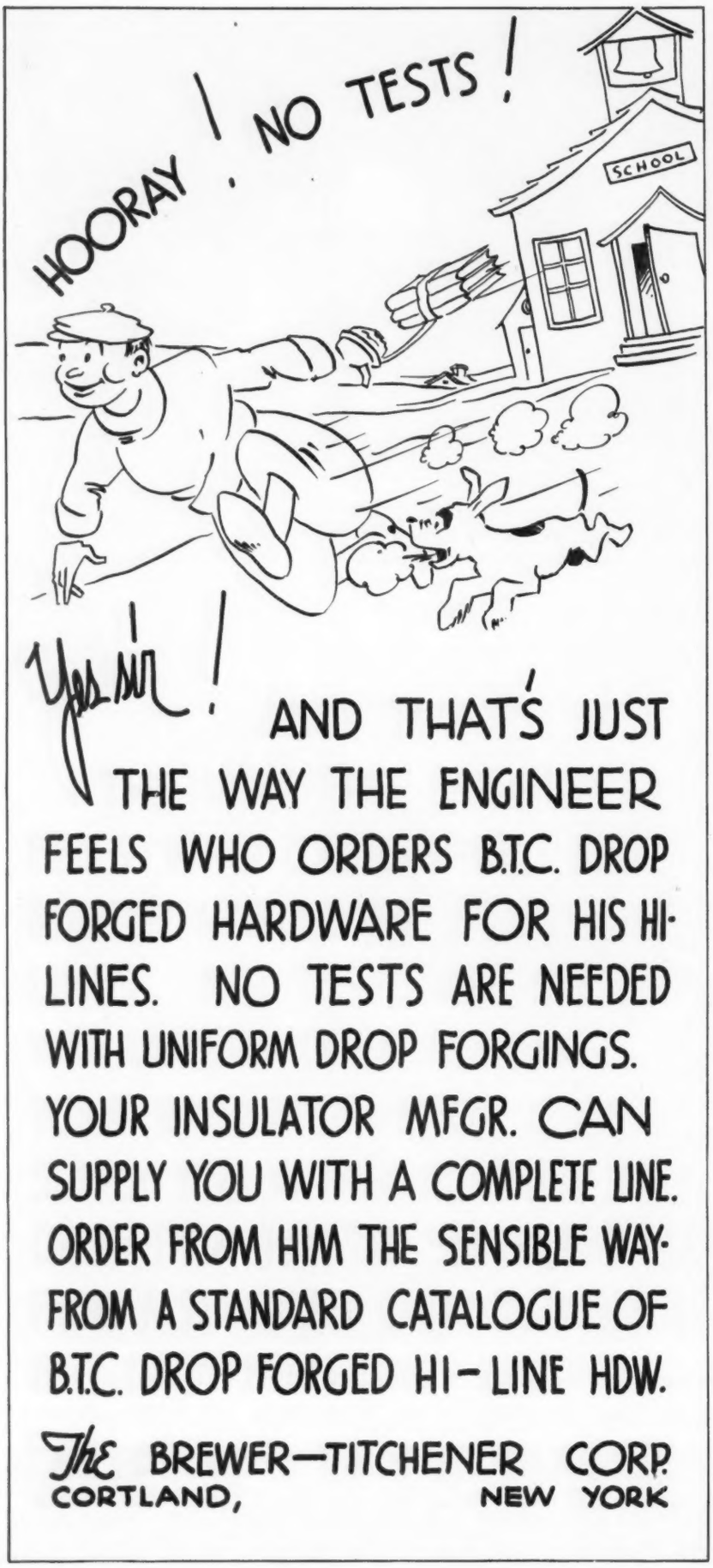
▶ THOMAS A. WATSON, telephone pioneer, died December 13 at Passagrille, Fla., in his eighty-first year. Dr. Watson was the trusted assistant of Alexander

L-M LIGHTNING ARRESTERS in "*PYREX*" GLASS BODY

Perfect visibility—at a glance you can easily see the condition of the L-M "PYREX" glass body Arrester without removing this arrester from the line. Available in the 1000, 3000 and 6000 volt sizes.

LINE MATERIAL CO

SOUTH MILWAUKEE, WISCONSIN, U. S. A.


HOORAY ! NO TESTS !
SCHOOL
Yes sir !
AND THAT'S JUST THE WAY THE ENGINEER FEELS WHO ORDERS B.T.C. DROP FORGED HARDWARE FOR HIS HI-LINES. NO TESTS ARE NEEDED WITH UNIFORM DROP FORGINGS. YOUR INSULATOR MFGR. CAN SUPPLY YOU WITH A COMPLETE LINE. ORDER FROM HIM THE SENSIBLE WAY-FROM A STANDARD CATALOGUE OF B.T.C. DROP FORGED HI-LINE HDW.
The BREWER-TITCHENER CORP.
CORTLAND, NEW YORK

Graham Bell before, during and after the invention of the telephone. He was a fellow of the American Institute of Electrical Engineers.

▶ FREDERICK H. WILKINS, an executive of American and European telephone companies, died December 25 in New York, after a long illness. He was 73 years old. Joining the Western Electric Company, he served as an assistant manager for several years and in 1911 was appointed its general manager in Europe. In England and on the Continent Mr. Wilkins became a leader in his industry and later was elected a vice-president of the International Telephone & Telegraph Company. He was also a director of other telephone companies abroad and of the Sperry Gyroscope Company, Ltd.

▶ C. V. COWAN, manager of the Southern Canada Power Company at St. Johns, Que., and formerly chairman of the St. Johns Board of Trade, died suddenly at his residence in that city November 26. He was 49 years of age. A graduate of McGill University, Mr. Cowan obtained his early experience with the Hydro-Electric Commission of Ottawa, the Montreal Light, Heat & Power Consolidated and with the Montreal Public Service Commission. Before affiliating himself with the Southern Canada Power Company in 1916 he spent one year in the engineering department of the Shawinigan Water & Power Company.

▶ GEORGE B. GALLAGHER, secretary and trustee of the Brooklyn *Citizen* and a prominent figure for years in Brooklyn banking and utility activities, died January 13. Mr. Gallagher retired from active business several years ago, but still maintained some of his business connections. Besides his trusteeship with the Brooklyn *Citizen*, he was a director of the Brooklyn Edison Company and a member of its executive committee. He also was formerly a director of the Brooklyn Rapid Transit Company, predecessor of the present Brooklyn-Manhattan Transit Corporation.

▶ ALFRED L. HARTRIDGE, president and general manager of the A. L. Hartridge Company, Inc., New York, and vice-president of the Stone & Webster Engineering Corporation, died, of a heart attack, on a Pennsylvania passenger train January 23 shortly before it reached Steubenville, Ohio. He was in his fiftieth year. Mr. Hartridge was a well-known construction engineer. Since 1909 he had been associated with the construction and engineering unit of Stone & Webster, Inc. He supervised construction operations on a number of power-station projects and had charge of the building of many banks, hospitals, apartment and office buildings. Construction work with which he was associated recently included the 50-story General Electric building in New York.

THIS TAG SAYS "IT'S PERFECT"

No manufacturer, however superior his materials, methods and equipment, can consistently and continuously turn out a flawless product. Every so often imperfections are bound to appear in spite of the ablest of men and the most accurate of machines.

Crescent recognizes this fact, and so takes a further step to insure, without any shadow of doubt, that the CRESTOLOY PLIER you buy *will be perfect.* Every Crestoloy Plier is *individually* tested. When you see the silver and blue tag on a Crestoloy Tool you *know* it's perfect . . that it has passed three of the most merciless tests *any* toolmaker *ever* devised.

And perfection as you find it in Crestoloy Pliers will be a revelation if you have never used these tools before. Forged from Crescent's own special analysis Crestoloy steel, these pliers have super-strength . . yet they are lighter, thinner, better-balanced . . easier and safer to use. And, surprising also, they cost little, if any, more than ordinary tools. Ask your Supply House or write for the Crescent Catalog.

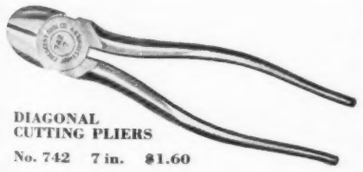
CRESCENT TOOL CO.
JAMESTOWN, N. Y.

NRA MEMBER U.S. CODE

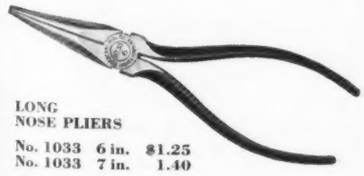
LONG NEEDLE NOSE PLIERS
No. 777 6 in. $1.60
No. 777 7 in. 1.75

LONG NOSE SIDE CUTTING PLIERS
No. 654 6 in. $1.50
No. 654 7 in. 1.65

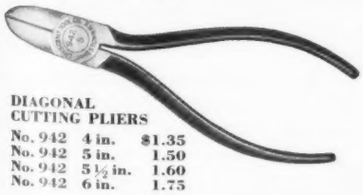
DUCK BILL PLIERS
No. 23 7 in. $1.50



DIAGONAL CUTTING PLIERS
No. 742 7 in. $1.60

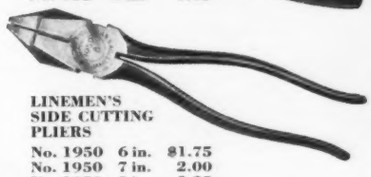


LONG NOSE PLIERS
No. 1033 6 in. $1.25
No. 1033 7 in. 1.40



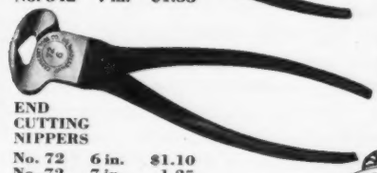
DIAGONAL CUTTING PLIERS
No. 942 4 in. $1.35
No. 942 5 in. 1.50
No. 942 5½ in. 1.60
No. 942 6 in. 1.75

CURVED NEEDLE NOSE PLIERS
No. 888 6 in. 1.85



LINEMEN'S SIDE CUTTING PLIERS
No. 1950 6 in. $1.75
No. 1950 7 in. 2.00
No. 1950 8 in. 2.25

HEAVY DIAGONAL CUTTING PLIERS
No. 542 7 in. $1.35



END CUTTING NIPPERS
No. 72 6 in. $1.10
No. 72 7 in. 1.25

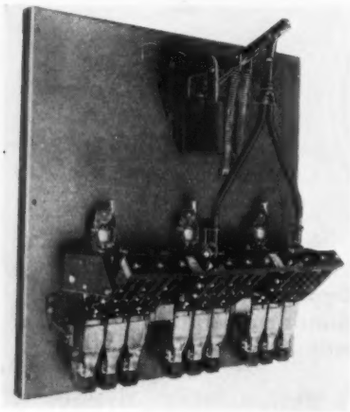
CRESTOLOY PLIERS

TRADE MARK REG U.S. PAT OFFICE

NEW EQUIPMENT

Type HD Air Circuit Breaker

Air circuit breakers, type HD, for heavy duty have been announced by the Roller-Smith Company, New York. These units have inverted brushes and secondary and carbon contacts, all of which increase



Roller-Smith

their closed pressure as the current increases. Opening speed and interrupting capacity are high because the moving arm does not carry the heavy brush. Contact pressure is adjustable without opening the breaker. Before the tripping mechanism engages there is a free preliminary movement of the latch. The one shown is a 4,000 amp. size. The series runs from 5 to 10,000 amp., 750 volts a.c., 600 volts d.c., live front or dead front, steel inclosed.

•

GUTH SUPER INDIRECT LIGHTING UNIT of the Edwin F. Guth Company, St. Louis, Mo., is durably built of porcelain enameled steel finished in ivory and white, with chromium stem. The lumo-vitro reflecting surfaces, plus the correct design of reflector bowl, account for its efficiency. The one size, 18 in. diameter, accommodates these lamp sizes: 300, 500, 750, 1,000 or 1,500 watts.

AN EXTRUDED RESISTOR with solid, homogeneous, full cross-section conduction body comprising a background or bulk material of high-resistance value, with a greater or less admixture of another resistive material of lower value to obtain desired ohmage in mass of fixed length and diameter, has been announced by Henry L. Crowley & Company, West Orange, N. J. The entire cross-section is uniformly current-carrying. The ends of the extruded length are coated with metal and capped with ferrules to which pigtails are integrally attached. These "Crolite" resistors have a smooth, rock-hard, black body, are solid and uniform throughout, with a protective coating.

•

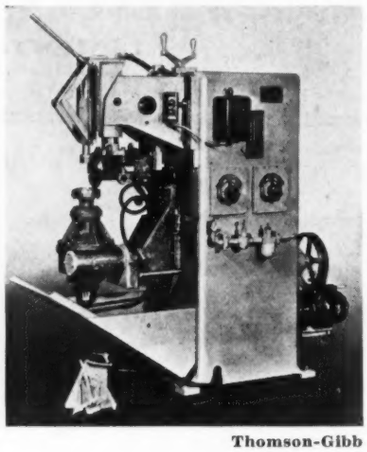
Numerals in Colors for Multiple-Point Recording

Reading of multiple-point instrument records is greatly simplified by a new system of numerals in colors announced by Leeds & Northrup Company, Philadelphia, Pa. This marking system can be specified on "Micromax" strip-chart recorders for 2, 3, 4 or 6 points. With each of the thermocouples, resistance thermometer bulbs or other primary elements identified on the chart by a numeral, and each numeral distinguished from the others by being printed in a contrasting color, reading of records is made easy, errors are avoided and time is saved. Colors used for printing the numerals are: black, green, red, violet, yellow and blue.

•

Seam Welder

A seam welder designed originally to assemble compression headers in General Electric refrigerators has been announced by the Thomson-Gibb Electric Welding Company, Boston, Mass. The bottom spherical half of the header is set in place in the lower welding roll, which is shaped to hold it in exact position. The top half is then placed upon

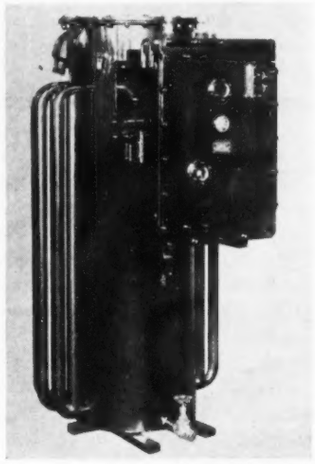


Thomson-Gibb

the upper or idler roll and quickly adjusted by a hand toggle work locator. A special worm drive operates the lower roll and a Reeves vari-speed pulley controls the welding speed within a range of $1\frac{1}{2}$ to $4\frac{1}{2}$ ft. per minute.

Secondary Network Unit

A secondary network unit consisting of a three-phase, subway-type transformer and a submersible type, light-duty network protector has been announced by the General Electric



General Electric

Company. The unit is available in ratings of from 45 to 150 kva.

The 75-kva. unit illustrated is 70 in. high and occupies a floor space 35 x 44 in. The transformer with the network protector removed will pass through a manhole opening 35 in. in diameter. The breaker is equipped with compression-type arc interrupters and an a.c. solenoid-operated trip-free operating mechanism. Relays are of the new induction-cylinder design, recently developed for use in network protectors and greatly reducing maintenance expense.

•

Magazine-Type Camera

Designed to operate over a wide range of film speeds and useful for all sorts of oscillographic and chronographic recording is the magazine-type camera announced by the General Radio Company, Cambridge A, Mass. One of its most useful applications, it is claimed, is in obtaining cathode-ray oscillograms or recurrent or transient phenomena, either as a continuous or an intermittent record.

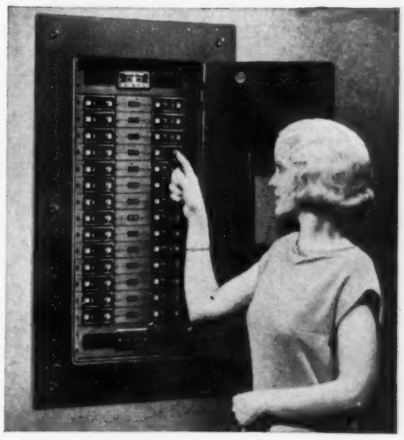
Film speeds may be adjusted by controlling the voltages applied to both motors simultaneously. Increasing the voltage momentarily to 230 volts gives a speed of 35 ft. per second. Decreasing the voltage to 65 volts gives a speed of about 1 ft. per second. For film speeds under

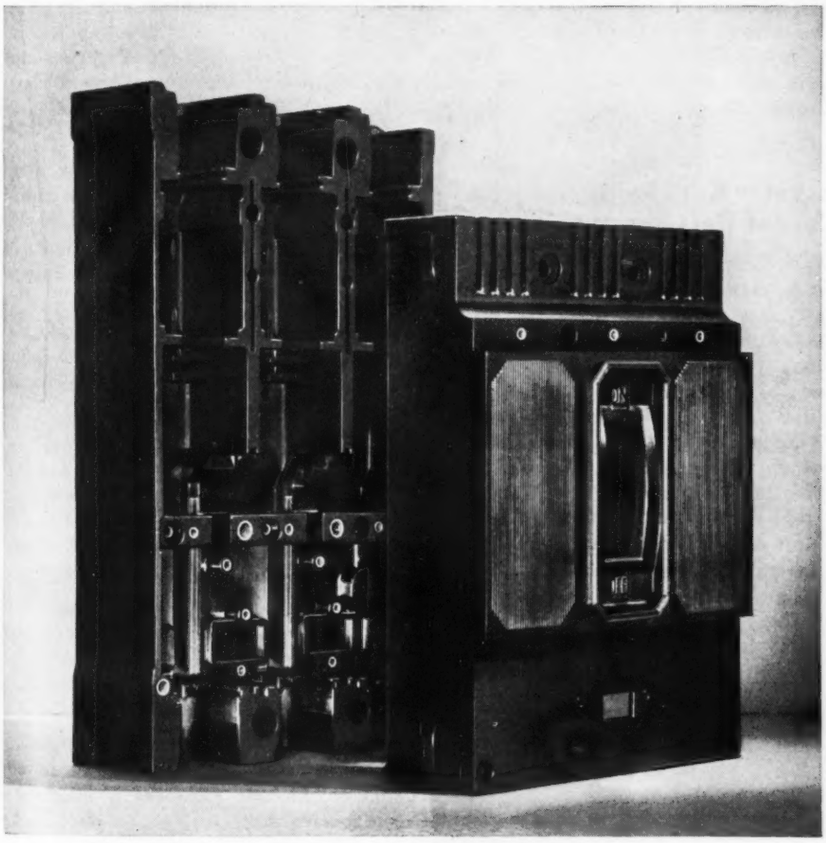
BETTER *Electrically and Optically*

through using Bakelite Molded

WHEN DESIGNING the new ITELITE line of circuit breakers the electrical engineer and the product designer had to agree upon a material that would meet the technical demands of one and also the appearance demand of the other. The one material that satisfied both was Bakelite Molded.

These circuit breakers, made in one, two and three pole units are completely housed in a two part Bakelite Molded case. The rear section, for mounting the circuit breaking mechanism is formed in one piece with all necessary lugs, bosses, channels, recesses, through holes, and partitions molded in. The numerous threaded metal inserts for mounting electrical parts and for terminals are firmly embedded in the molding operation. The dielectric strength of Bakelite Molded simplified the insulation problem and provided a "dead front" for the devices.





From an appearance standpoint the use of Bakelite Molded was equally successful. Every detail of the attractive design, including the grooved panels, the necessary lettering and the flat lustrous surfaces, is accurately reproduced in the mold. No subsequent polishing or enameling is required.

Because of its high insulation value, strength, resistance to moisture, heat, cold, oils, and most chemicals and fumes, Bakelite Molded has proved to be an ideal insulation material for electrical devices and appliances of many kinds. There are several types of this material all of which are illustrated and described in our booklet 25M, "Bakelite Molded". Your request will bring a copy by return mail.

(Left) Three pole Itelite circuit breaker with Bakelite Molded case. Designer, Harrie A. Bell. Manufacturer, I.T.E. Circuit Breaker Co., Philadelphia, Pa. (Above) Single pole Itelite Bakelite Molded circuit breakers assembled on panel.

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BAKELITE CORPORATION OF CANADA, LIMITED, 163 Dufferin Street, Toronto, Ontario, Canada

BAKELITE

REGISTERED U. S. PAT. OFF.

The registered trade marks shown above distinguish materials manufactured by Bakelite Corporation. Under the capital "B" is the numerical sign for infinity, or unlimited quantity. It symbolizes the infinite number of present and future uses of Bakelite Corporation's products.

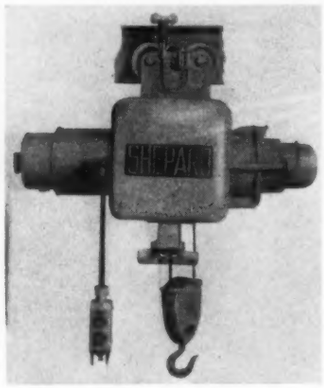
THE MATERIAL OF A THOUSAND USES

about 5 ft. per second a full magazine may be used and the camera started and stopped as often as required.

•

Five-Speed Push-Button Controller

Giving the hoist or crane operator complete control of every speed point throughout the operating cycle is the claim made for the new Shepard selective five-speed



Shepard Niles

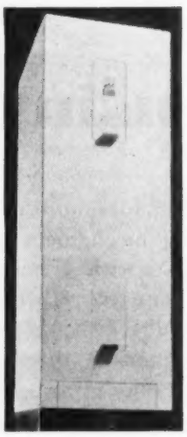
push-button controller of the Shepard Niles Crane & Hoist Corporation. The five speeds up and down are controlled from one button. They are built in two sizes, 3 hp. and 7½ hp., respectively.

•

Metal-to-Glass Seal Sturdy and Reliable

Metal-to-glass seal employing "Fernico" alloy has been announced by the General Electric Company, which has opened up many possibilities in the development of various classes of vacuum tubes and other devices wherein leading-in wires or conduction parts must pass through gas-tight insulating seals or themselves form part of a gas-tight chamber. The alloy Fernico can be machined, forged, punched, drawn, stamped, soldered, copper-brazed and welded with a facility equal to that with which these operations can be performed on a high-grade nickel-iron.

Water Heater With Modern Lines



Edison General Electric Appliance

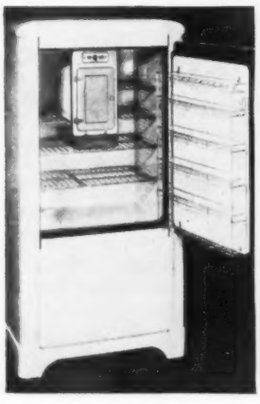
A water heater featuring square corners and smart straight lines to fit into the modern electric kitchen has been announced by the Edison General Electric Appliance Company. It is done in white enamel with an inclosed black enameled base set back to provide toe space. This model, the "Vogue," is being manufactured only in 40-gal. capacity, plain storage type. All Hotpoint features, such as heavy insulation, Hotpoint Calrod heating units and Thermosnap automatic temperature control switches, are retained. Single-unit style or double-unit model with double-throw Thermosnap control are available. New flange fittings on the Calrod heating units make it possible to remove them through the side of the tank.

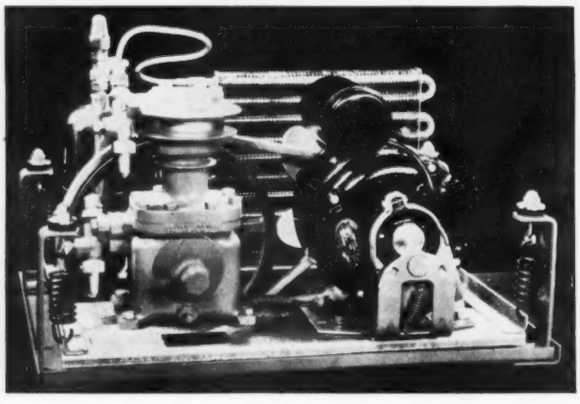
•

Atwater Kent Launches Line of Refrigerators

The compressor unit of the new line of A. Atwater Kent domestic refrigerators has reserve capacity double the maximum requirements of the 7-cu.ft. box. It will also be used in the 4,- 5- and 6-ft. boxes which comprise the initial line. Cabinet features comprise an all-porcelain freezing unit located in the top center, affording food storage space on both sides for tall items; self-sealing chrome-plated door to freezing unit; automatic defrosting; 12-point temperature control with special light duty position; shelves on inside of door for frequently used small items.

A large section of the 32-acre plant at Philadelphia has been given over to the refrigeration division and provided with production facilities for practically any volume, says the company announcement.





Atwater Kent

•

WEATHERPROOF, DUST-TIGHT TYPE A SAFETY SWITCHES in standard sizes from 30 to 600 amp. capacity are now being supplied by the Electric Controller & Manufacturing Company, Cleveland, Ohio. Outstanding features of these safety switches are compactness, narrow width, light weight, due to steel inclosures (most weatherproof safety switches are inclosed in cast iron), semi-floating, double-break V-blades and V-stationary contacts backed up with steel springs which guarantee full contact under heavy pressure.

ENGINEERING DATA FROM MANUFACTURERS

Bulletins and catalogs now available to engineers by manufacturers and associations

The Linde Air Products Company (New York) has issued two new engineering booklets, "Recommended Practices for Gas Cutting of Structural Steel" and "Precautions and Safe Practices" for welding and cutting equipment.

How termites and decay destroy wood and can be controlled by transparent penetrating creosote is discussed in 15-page booklet of Reilly Tar & Chemical Corporation, New York, affiliate of Republic Creosoting Company.

The fourth compilation of articles describing the construction job at Boulder Dam has been published by Ingersoll-Rand, 11 Broadway, New York.

Canadian Engineering Standards Association (Ottawa) has published specification No. 8 covering construction and tests on suppressing capacitors and No. 18 on outlet boxes. Each is 25 cents. Comments are desired.

Structural assemblies of metal-clad units, control panels, switch houses and cubicles are shown in new Roller-Smith Company (New York) catalogue No. 8. in 24 pages.

Specifications for portable welders rated 300, 400 and 600 amp. are in the Lincoln Electric Company (Cleveland) bulletin No. 302.

General Electric Company has issued new GEA bulletins giving design features and application data; 1137B, indoor a.c. cubicle switchgear; 1327A, indoor disconnecting switches; 1585A, high-voltage magnetic switches; 1997, instantaneous overcurrent relays; 2006, auxiliary relays with mercury contacts; 2009, directional ground relays; 2012, transfer relays for C.T. tripping; 2014, current balance relays.

THIS IS A MICA SPECIALTY

Thicknesses are held exactly, holes are located according to specifications, profile and forms are true to shape and size. Modern equipment, long experience, frequent inspections and tests at all stages of production save Macallen customers from delays in assembly, break downs and servicing costs. If it is Mica in any form, Macallen makes it.

Mica is not a substitute—there is no substitute for Mica as an insulating material. Unaffected by heat, moisture, or oil.

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AMCRECO POLES
meet 1935 conditions

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4. Preservative of known value.
5. Adequate single treatment
6. Treatment accurately timed to proper seasoning.
7. Full length pressure treated.
8. Unequalled facilities and personnel of the leading producer.

IF business is to be increased, service must be made available to more prospects. Good poles are one of the first requirements.

If pressure for lower rates is to be met, plant standards must be kept high and annual costs low. AmCreCo poles have an enviable record of long life and high strength which makes them the choice on the basis of economy and dependability.

If sound judgment is to prevail, reliance will still be placed on demonstrated value in wood preservatives, rather than to experiment on a big scale with "modern" treating materials and methods.

AMERICAN CREOSOTING COMPANY
INCORPORATED

COLONIAL CREOSOTING COMPANY INCORPORATED

AMCREO LOWRY PROCESS CREOSOTED WOOD

GEORGIA CREOSOTING COMPANY INCORPORATED

LOUISVILLE — KENTUCKY

Recent Rate Changes

New York Power & Light Corporation has filed with the state Public Service Commission a petition for approval of a lower and greatly simplified residence electric rate which will effect an annual saving of $600,000. The new rates will apply in all communities served by the company where rates of the counted room or service charge type are now in effect. There will be one rate for all residence and farm customers in the capital district and adjoining territory as follows: 75 cents net, including first 10 kw.-hr.; 5 cents net for each of the next 45 kw.-hr.; 2.8 cents net for each of the next 145 kw.-hr. and 1½ cents net for each additional kilowatt-hour of monthly use. The company also announced a "share-the-benefits" plan whereby additional reductions in rates will be made just as fast as these new and lower rates have produced increases in the average annual use.

•

Indiana General Service Company and the Indiana & Michigan Electric Company have filed new schedules with the state Public Service Commission, reducing electric rates for 48,300 consumers in north central Indiana. Customers of the Indiana General Service Company will save $34,000 a year and those of the Indiana & Michigan company $71,700 annually if the schedules are approved.

•

Lowell Electric Light Company has been ordered by the Massachusetts Department of Public Utilities to reduce its rates to commercial and domestic users $60,000, annually.

•

Empire District Electric Company, Joplin, Mo., serving approximately 75 cities, towns and communities and a large rural area in adjacent sections of Missouri, Kansas and Oklahoma, has announced a voluntary reduction in domestic and commercial power rates throughout its territory. The new schedule, effective on bills payable on and after April 1, will mean an annual saving of approximately $90,000 to consumers.

•

Northern States Power Company's compromise ordinance was passed by the St. Paul City Council, thus making possible a reduction in electric rates in that city on February 1. The compromise ordinance calls for an immediate cut of $221,000 for 1935 and $125,000 additional for 1936, with a continuance of payment of the 5 per cent tax on gross earnings.

•

Peoples Light Company has announced a new light rate to be in effect

Fabricating crane trolley side with "Shield-Arc" welder and "Fleetweld" electrodes in plant of Shaw-Box Crane & Hoist Co., Muskegon, Mich.

YOU CAN MEASURE

PROFIT

BY THE POUND

LAD "Pop, I've got two tickets for the Follies tonight."

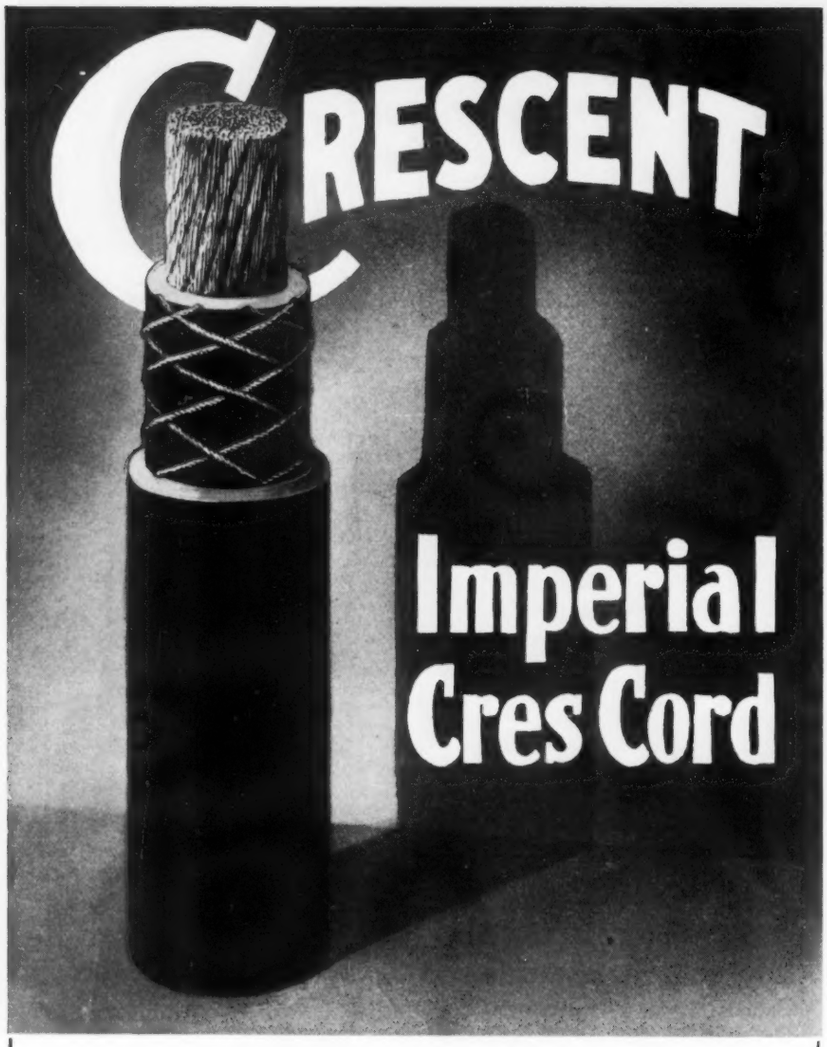
POP "No, thanks—take your girl. I've seen my follies for today. I found we were coupling our plant water lines, and with a Lincoln *'Shield-Arc'* welder right on the production floor, that could do the job better at a good fourth less. Believe me, I fixed that foolishness." W-96

. . . OR by the foot or by the kilowatt hour when you weld with a *"Shield-Arc."* As measured by any of these units, *"Shield-Arc"* is guaranteed to produce more welding per dollar. Check into *"Shield-Arc's"* more uniform current, higher efficiency, high capacity, and its eight other features . . . then you'll learn more than any advertisement can ever tell you how *"Shield-Arc"* drops costs and raises profits.

"Shield-Arc's" faster welding proved to one manufacturer that he had been tossing away $6.50 every day he used an old type welder. Find out now how much a *"Shield-Arc"* can save you. Ask The Lincoln Electric Company, Cleveland, Ohio. Largest Manufacturers of Arc Welding Equipment in the World.

LINCOLN

"SHIELD-ARC" WELDERS



Crescent Heavy Duty Portable Cords and Cables
Single and Multiple Conductor

are made of the highest grade materials and workmanship. IMPERIAL CRESCORD has a mould-cured tire tread type of 60% rubber jacket and is practically impervious to cuts, abrasion, water, acids, and alkali, and is very oil resistant.

CRESCENT PRODUCTS

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SIGNAL CABLES	PARKWAY CABLES
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and all kinds of Special Cables to meet A.S.T.M., A.R.A., all R.R., Gov't and Utility Co's specs.

CRESCENT
INSULATED WIRE & CABLE CO. INC.
TRENTON, NEW JERSEY.

Gentlemen: Please send me your NEW catalog

NAME .....

ADDRESS .....

until a reduction acceptable to the city council can be agreed upon. The new rate, "optional electric residential rate," sets a 25-kilowatt-hour minimum on a five-room house, charged at 6½ cents per kilowatt-hour; the second 25 at 4½ cents and 2½ cents for all over 50 kilowatt-hours. The old rate for 100 kw-hrs. was $4.27 and under the new $4.

•

Iowa Public Service Company, serving some 164 municipalities and villages in Iowa, has announced rate reductions in a large number of the communities served, ranging from 7½ per cent to 20 per cent, depending on type of service.

•

Old Dominion Power Company's request for a re-opening of the case in which power rates to coal operators were ordered lowered, has been refused by the Virginia State Corporation Commission.

•

Potomac Edison Company's amended schedule of rates filed in compliance with an order of the Maryland Public Service Commission has been rejected by the commission. The commission order called for a reduction of $325,000 (ELECTRICAL WORLD, January 19, page 70). Under the terms of the amended schedule only approximately $215,000 will be allocated to Maryland customers and $110,000 to wholesale and small power customers which, the commission states, operate in Virginia, West Virginia and Pennsylvania. The commission has ordered the company to file amended schedules carrying into effect the full amount of $325,000 reduction to Maryland customers.

•

West Penn Power Company has filed a rate schedule with the state Public Service Commission providing for a reduction in domestic, commercial and power rates totaling approximately $706,000 annually.

•

Public Service Electric & Gas Company submitted a reduction of $16,233,560 in the electric rate base valuation at the continued hearing before the state Board of Public Utility Commissioners. The exhibits showed a valuation of $429,275,510 for the electric division property, compared with $445,509,070 originally claimed. Almost all the evidence at the prolonged hearings has been directed at the rate base valuation.

•

Ohio Power Company has announced a reduction in power rates which will result in an ultimate saving of $1,300,000 a year to its 185,000 consumers. The reduction will be progressive for a one-year period with initial savings effective with the March billings. Subsequent reductions will follow until March, 1936, by which time the kilowatt-hour charge will have been reduced an average of 14 per cent.

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WITH a battery of extreme power, sustained voltage, ruggedness of construction and high electrical efficiency, electric industrial trucks can render the remarkable service of which they are really capable. For it is *power* that enables the truck to handle heavy loads against grades; *sustained voltage* that enables it to keep up its speed to the end of the shift; *ruggedness* and *high* electrical efficiency that makes it economical to maintain.

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NRA CODE

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IRONCLAD BATTERIES
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"MIPOR," Reg U. S. Pat. Off.

THE ELECTRIC STORAGE BATTERY CO.
PHILADELPHIA
The World's Largest Manufacturers of Storage Batteries for Every Purpose
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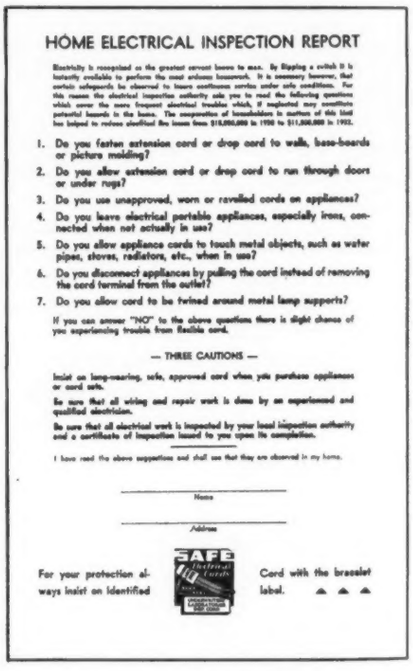
Improving Service and Safety in the Home

Service troubles have long been recognized* by utilities as depending to a great extent on the wiring in customers' homes. Maintenance of appliances, equipment and wiring is essential to proper conditions and service in the home. The "Electrical Cord Manufacturers" group of N.E.M.A. made the first national attempt to reduce the amount of shoddy portable cord installed in homes by featuring the value of cord bearing the Underwriters' bracelet at intervals. Utility executives, manufacturers, dealers are rapidly recognizing the importance of the movement and fostering it locally. Even Woolworths, Sears Roebuck and many department stores are insisting on the approved cord.

Several aids to promotion of safe portable cord are being given by the N.E.M.A. cord manufacturers, which can be used



HOME ELECTRICAL INSPECTION REPORT

Electricity is recognized as the greatest servant known to man. By flipping a switch it is instantly available to perform the most arduous housework. It is necessary however, that certain safeguards be observed to insure continuous service under safe conditions. For this reason the electrical inspection authority asks you to read the following questions which cover the more frequent electrical troubles which, if neglected may constitute potential hazards in the home. The cooperation of householders in matters of this kind has helped to reduce electrical fire losses from $10,000,000 in 1920 to $11,500,000 in 1933.

1. Do you fasten extension cord or drop cord to walls, base-boards or picture molding?
2. Do you allow extension cord or drop cord to run through doors or under rugs?
3. Do you use unapproved, worn or ravelled cords on appliances?
4. Do you leave electrical portable appliances, especially irons, connected when not actually in use?
5. Do you allow appliance cords to touch metal objects, such as water pipes, stoves, radiators, etc., when in use?
6. Do you disconnect appliances by pulling the cord instead of removing the cord terminal from the outlet?
7. Do you allow cord to be twined around metal lamp supports?

If you can answer "NO" to the above questions there is slight chance of you experiencing trouble from flexible cord.

— THREE CAUTIONS —

Insist on long-wearing, safe, approved cord when you purchase appliances or cord sets.

Be sure that all wiring and repair work is done by an experienced and qualified electrician.

Be sure that all electrical work is inspected by your local inspection authority and a certificate of inspection issued to you upon its completion.

I have read the above suggestions and shall see that they are observed in my home.

Name

Address

For your protection always insist on identified SAFE Electrical Cords Cord with the bracelet label.

Questions for school children to answer

by every electrical, safety and fire-interest locally. One is a booklet on "Safeguarding the Home." A very impressive poster† portraying hazardous practices is being distributed among home-economics classes, dealers and service men. "Home Electrical Inspection Reports" (containing seven questions for householders to answer that bring out hazards covered in the poster) are being distributed among school children and homes by inspection and fire departments. The Ridgewood, N. J., school is distributing them among

* See ELECTRICAL WORLD, page 1309, December 24, 1927, "Home Servicing—Whose Duty?" by Ralph W. Liddle, Commonwealth Edison Company. †See ELECTRICAL WORLD, page 68, Feb. 2, 1935.

students. "Electrical Inspection News," issued once a month, indicates timely information for newspapers and other outlets to the public. Information from the latter is being incorporated by the Boston Edison Company in small four-page pamphlets distributed with bills. A different assembly of information goes out each month.

•

Manufacturer Protests Lower Tariff on Meters

R. C. Lanphier, president of the Sangamo Electric Company, recently appeared before the federal government's committee on reciprocity trade agreement in Washington to request that the tariff on electric meters be maintained. Mr. Lanphier was among a group of industrialists who appeared before the committee and denounced proposals of the government to lower tariffs to Switzerland. He was in the peculiar position, he said, of arguing against and for his own interests at the same time, since his company owns the British Sangamo Company, Ltd., of London.

"We pay more than most English factories do," he said, "but the wage is 21 cents an hour in London and 69 cents an hour in Springfield. As a matter of fact, we could set down our own meters, manufactured in London, at a less cost in New York, provided the tariff wall was removed, than we could manufacture them in Springfield. We could actually undersell ourselves."

•

N. Y. C. Housing Committee to Sponsor Exhibition

The F.H.A. Better Housing Committee of New York City will sponsor a Better Housing Exposition which will be held at the Port Authority Building, New York City, March 25-31, inclusive. It is said that this will be the largest and most comprehensive Better Housing Home and Building Modernization Exposition held in the United States. The committee expects an attendance of more than 1,000,000 people.

•

Wiring Device Code

Approval of a supplementary code for the wiring device industry, a subdivision of the electrical manufacturing industry, has been announced by the National Industrial Recovery Board. The supplemental code is devoted mainly to formulations of unfair trade practices.

•

Leonard's 1935 Line

Six porcelain and six lacquer-finished models comprise the Leonard Refrigerator Company's 1935 line. Food storage capacities range from 10.59 cu.ft. in the porcelain de luxe group to 4.25 cu.ft. in the smallest cabinet.

RADIATORS

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for cleaning or painting

•

NO matter how large a Pennsylvania Transformer may be, each individual radiator contains ten tubes only, and each tube is accessible for cleaning or painting. All radiators are permanently welded to tank.

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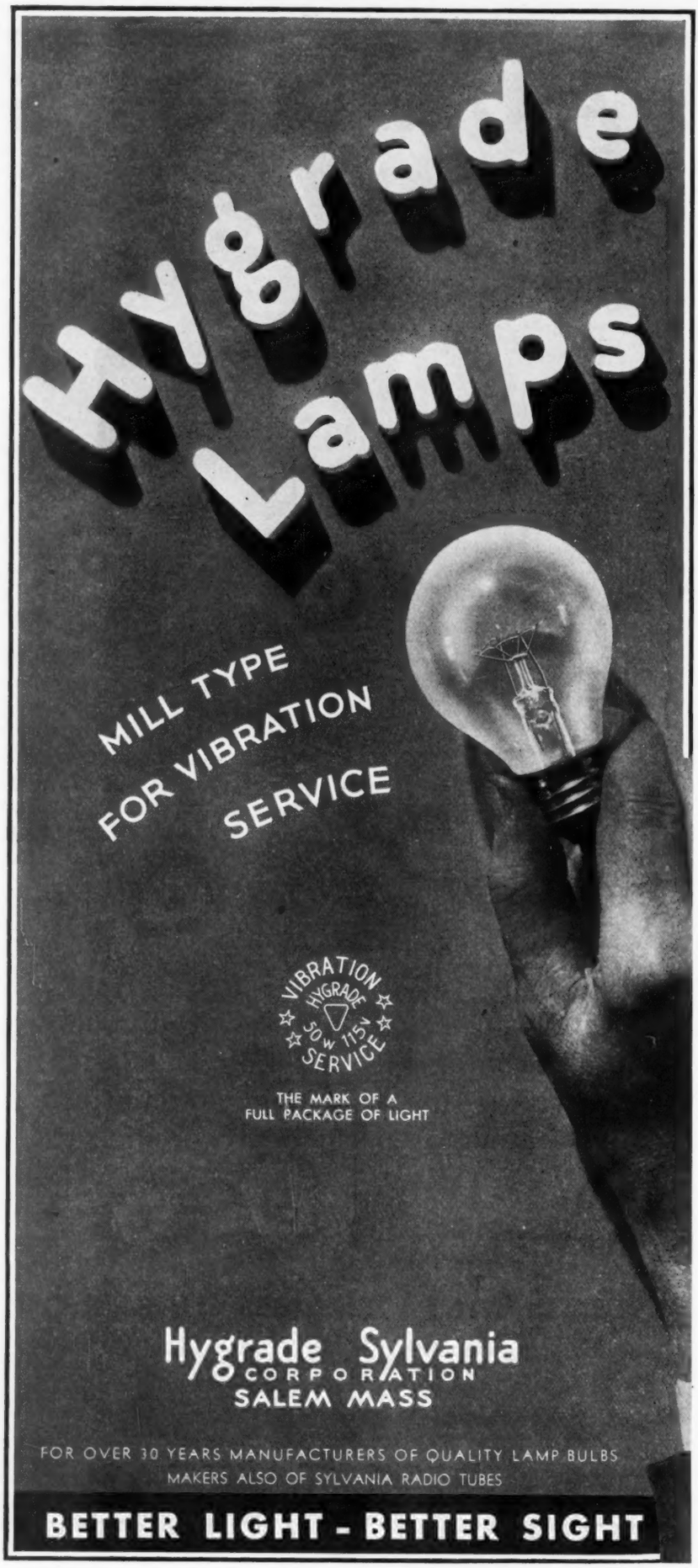


Best Year Since 1931 Reported by Cutler-Hammer

Net shipped sales of Cutler-Hammer, Inc., for the year 1934 totaled $5,116,098, compared with $3,655,367 in 1933. In 1932 sales amounted to $3,001,897 and in 1931 they were $5,912,792.

•

Now for a Power Map

In its survey of rates for electricity the Federal Power Commission is incidentally collecting detailed statements as to the territory served by each reporting company. It is also asking for maps of transmission lines and of the location of power plants.

There has long been a demand for maps showing the service areas of the various companies and of transmission systems throughout the country. The cost to a private agency of compiling such maps on an adequate scale is prohibitive. The job is properly one for the federal government. France has already pointed the way with a magnificent chart of her transmission lines on a large scale.

The most persistent inquiries come from federal agencies, departmental and alphabetical. Wouldn't it be admirable if these agencies could discover one another despite the maze of organizations and if, with the necessary material in its possession, the commission were to produce an atlas worthy of the United States!

•

Foreign Trade Committee Formed by Nema Division

In order to be able to present material leading to favorable consideration of electric refrigerators in the reciprocal trade agreements being negotiated by the State Department, a special Foreign Trade Committee has been appointed by the chairman of the Refrigeration Division of the National Electrical Manufacturers Association.

•

Los Angeles Awards Boulder Dam Contracts

Award of contracts totaling $371,330 for oil circuit breakers for the Los Angeles, Calif., Bureau of Power and Light Boulder Dam transmission system has been made by the Municipal Board of Water and Power Commissioners. General Electric Company was given the contract to furnish four special 138,000-volt oil circuit breakers at the price of $120,450. The Kelman Electric & Manufacturing Company was awarded the contract to furnish sixteen oil circuit breakers at a figure of $250,880. The equipment will be used at the bureau's receiving stations.

1935 Merchandising Contest Sponsored by E.E.I.

To encourage more aggressive sales effort on the part of all dealers in electrical appliances, the Electrical Housewares Committee has announced a Better Merchandising Contest for 1935. There will be a total of $2,400 in prizes with allotment of $600 in each quarter. The committee is a joint committee of manufacturers and utility representatives.

A first prize of $100 and a second prize of $50 are offered to the winners in each of three classes of outlets, namely, (1) departmentalized stores, (2) other retail outlets, (3) utilities. There will also be five honorable mention prizes of $10 in each class.

The contest is sponsored by the Edison Electric Institute in conjunction with the following appliance manufacturers: General Electric Company, Hamilton-Beach Manufacturing Company, Knapp-Monarch Company, Landers, Frary & Clark, the Manning-Bowman Company, Proctor & Schwartz Electric Company, Robeson Rochester Corporation, the Silex Company, Waters-Genter Company, Westinghouse Electric & Manufacturing Company, Swartzbaugh Manufacturing Company and the American Electrical Heater Company.

•

Rapid Expansion Predicted for Air Conditioning

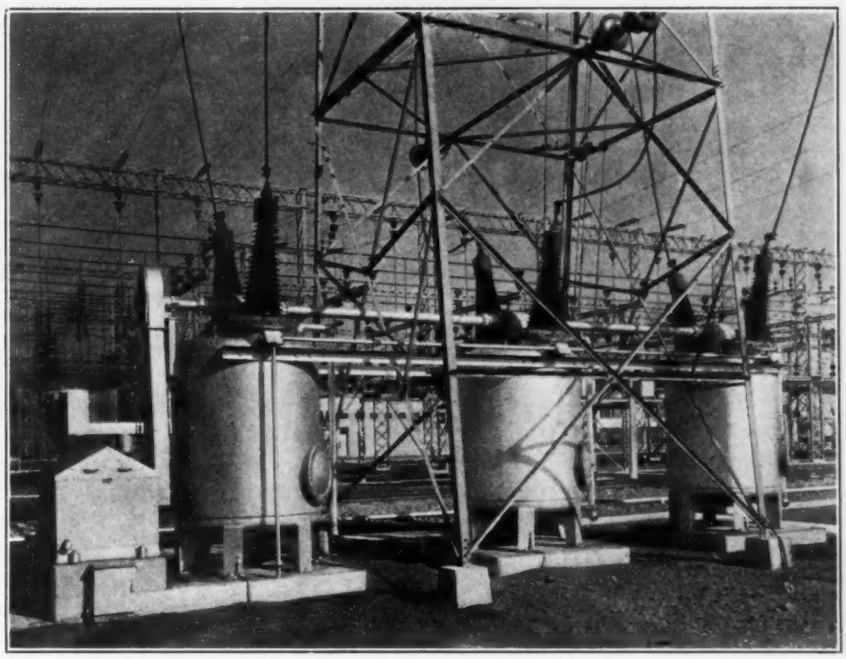
The year 1935 promises, even more than ever, to be an air-conditioning year, in the belief of Elliott Harrington, who recently assumed the duties of directing sales of unified air-conditioning systems for the General Electric Company. "It will see even more rapid expansion," he says, "of air conditioning in commercial establishments such as theaters, restaurants and shops, in order to maintain or increase patronage. Offices and apartments will contribute substantially to the air-conditioning market in 1935. Railways will increase the number of air-conditioned trains in operation. Complete air conditioning of the home will be extended, and our temporary home, the hotel, will contribute measurably to this growing market."

•

Carrier Corporation Gets $1,000,000 Loan

The Federal Reserve Bank of New York has granted a loan of $1,000,000 to the Carrier Corporation of Newark, N. J., maker of air-conditioning equipment, according to an announcement made by J. I. Lyle, president of the corporation. The loan, which runs for five years, was guaranteed by the Federal Reserve Bank of New York.

This Breaker Can TAKE IT



THIS Pacific oil circuit breaker can take it. Equipped with expulsion contacts, it is installed at the Newark Substation of the Pacific Gas & Electric Company. During 1934 it was called upon to interrupt many severe short circuits yet no maintenance work of any kind was done on it. A recent test showed the oil to be clear and as high in dielectric strength as the day it was put in the tanks.

Pacific expulsion breakers always give this kind of service. They are furnished in standard ratings from 15,000 to 230,000 volts.

You can obtain similar results by modernizing your present Pacific breakers with expulsion contacts. They can be installed quickly, easily, and economically. Ask our representative for complete information.

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SALES OPPORTUNITIES IN NEW CONSTRUCTION

MODESTO, CALIF. — Modesto Irrigation District asks bids until February 11 for new transmission line from Don Pedro power plant to Modesto, comprising second circuit on present poles, requiring about 192,000 lb. bare copper cable, 5,000 suspension insulators, line hardware, oil circuit breaker and accessory equipment. Fund of $60,000 has been authorized.

WINSTON-SALEM, N. C. — Has surveys and plans under way for new city-owned electric light and power plant, including distribution lines. Cost about $200,000. W. C. Olsen, Raleigh, N. C., is consulting engineer.

NASHVILLE, TENN.—United States Tobacco Company, New York, N. Y., plans installation of motors and controls, conveyors and other equipment in new multistory plant at Nashville, for which bids will soon be asked on superstructure. Cost about $200,000. Hart, Freeland & Roberts, Independent Life Building, Nashville, are architects.

HASTINGS, NEB.—Asks bids until February 5 for auxiliary electrical equipment for city-owned light and power plant. Black & Veatch, Mutual Building, Kansas City, Mo., are consulting engineers.

PHILADELPHIA, PA.—Philadelphia Electric Company has authorized fund of $8,800,000 for construction and improvements in 1935, including completion of addition to Richmond generating station, now under way, estimated to cost about $4,200,000 of gross amount noted, new transmission and distributing lines, power substation expansion and miscellaneous work.

COLUMBUS, OHIO — Is arranging additional fund for electric light and power plant development, totaling about $1,100,000 for new generating plant unit, installation of 10,000-kw. turbo-generator and auxiliary equipment. Financing will be carried out through P.W.A., which recently approved loan of $320,000 for part of project.

BELLE, W. VA.—Givaudan-Virginia, Inc., Security Bank & Trust Building, Charleston, W. Va., recently organized, plans installation of motors and controls, transformers and accessories, conveyors, etc., in new aromatic chemical plant at Belle, where tract of land has been purchased. Cost close to $100,000.

WASHINGTON, D. C.—Bureau of Supplies and Accounts asks bids until February 8 for quantity of electric cable, wire and cord for Brooklyn, N. Y., Navy Yard (Schedule 4152); at same time, for 8,000 ft. rubber-insulated welding electric cable for Philadelphia, Pa., Navy Yard (Schedule 4188); until February 12 for one main distribution low-voltage board for Washington yard (Schedule 4192); until February 15 for six motor-driven compressor sets, ammeters, voltmeters and spare parts for Portsmouth and Mare Island Navy Yards (Schedule 4175).

GEORGETOWN, TEX. — Georgetown Oil Mills, Inc., plan installation of motors, controls, loaders, conveyors and other equipment in connection with rebuilding of cottonseed oil mill, recently destroyed by fire with loss of about $100,000.

BURLINGTON, KAN. — Soon takes bids for city-owned electric light and power plant, with municipal electrical distribution system. Fund of $145,000 is being arranged. E. T. Archer & Company, New England Building, Kansas City, Mo., are consulting engineers.

ARKANSAS CITY, ARK.—Arkansas Power & Light Company, Pine Bluff, Ark.,

has acquired electric light and power plant at Arkansas City, and will furnish service in future, converting plant for power substation for distribution.

CALIFORNIA CITY, CALIF. — John A. Roebling's Sons Company, Trenton, N. J., plans installation of heavy-duty motors and controls, electric hoists, conveyors and other equipment in new steel cable plant at California City. Cost over $200,000.

WASHINGTON, D. C.—General Purchasing Officer, Panama Canal, asks bids until February 13 for five distributing-type transformers, 75,000 ft. lamp cord, 5,000 ft. copper cable, parts for street-lighting posts, fuse plugs, cartridge-type fuses and other electrical supplies (Schedule 3027).

AUBURN, N. Y.—Is having plans completed for new city-owned electric light and power plant, with electrical distribution system. Proposed to arrange bond issue of $1,500,000 for project and finance without Federal aid. Burns & McDonnell Engineering Company, 107 West Linwood Boulevard, Kansas City, Mo., is consulting engineer.

CHARLOTTE, N. C. — Larkwood Silk Hosiery Mills, Inc., plan installation of motors and controls, regulators, conveyors and other equipment in new multi-story addition to knitting mill. Cost about $300,000. George N. Rhodes, Charlotte, is architect.

LODI, WIS. — Plans city-owned electric light and power plant, using Diesel engine-generating units. Estimates of cost are being made. Application has been made for permission.

BAKERSFIELD, CALIF.—Bakersfield Brewing Company has authorized construction of new multi-story plant. Cost close to $100,000 with equipment.

DETROIT, MICH.—Murray Corporation of America, Inc., plans installation of heavy-duty motors and controls, electric hoists, conveyors, etc., in new addition to heavy metal stamping division works at Ecorse, near Detroit. Cost over $100,000.

MACEDONIA, IOWA—Iowa-Nebraska Light & Power Company, Lincoln, Neb., is considering extensions and improvements in electrical distribution system and service facilities at Macedonia. Cost reported close to $50,000.

DENVER, COLO. — Bureau of Reclamation asks bids until February 6 for 333-kva. station type transformer, one set high and low windings and one set voltage windings, etc. (Proposal 9162-A). Also, until February 11, for one portable high-potential test set and portable dielectric testing equipment for Boulder power plant, Boulder Canyon, Arizona - California - Nevada (Specification 655-D).

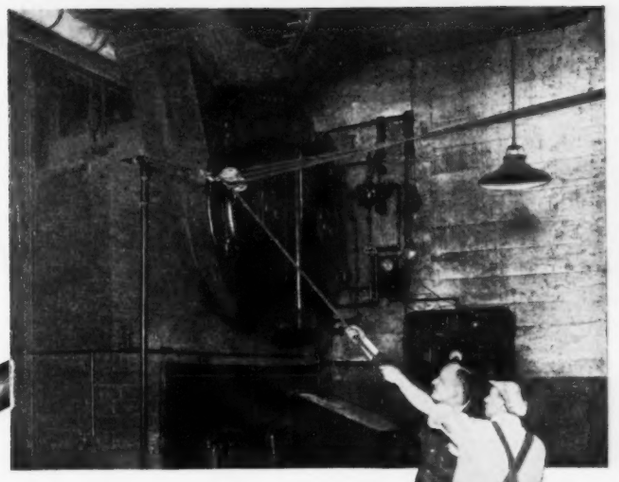
LOUISVILLE, KY. — Kentucky Brewing Company plans new addition, to be used primarily as a bottling works. Cost about $200,000, including equipment.

RACHEL, W. VA.—Bertha Coal Company, Pittsburgh, Pa., plans installation of motors and controls, hoists, conveyors, loaders and other equipment in connection with rebuilding of coal tipple at mining properties at Rachel, recently destroyed by fire. Loss about $100,000.

LYNCHBURG, VA. — Appalachian Electric Power Company, Roanoke, Va., has approved plans for new power substation on Fifteenth Street, Lynchburg. Cost about $70,000.

IOWA CITY, IOWA—Iowa City Light & Power Company plans extensions in transmission lines in Johnson County.

MEMPHIS, TENN.—Plough, Inc., plans installation of motors and controls, conveyors and other equipment in new multi-unit chemical plant to be built early in spring, for which Arthur L. Nelson, Engineers, Inc., 31 St. James Avenue, Boston, Mass., consulting engineers, have been engaged to make surveys and plans. Cost about $1,000,000.



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NEXT WIRE FAILURE
can be an
OPPORTUNITY

Circuit replacements like this one are regular events when ordinary insulated wires are subjected to severe service. In fact, they are so regular that we don't blame engineers unfamiliar with ROCKBESTOS wires for looking on them as matters of course.

But they are not really necessary. For ROCKBESTOS insulated wires withstand heat, oil, moisture, fumes and acids indefinitely, as you can prove to your own satisfaction on a circuit of your own, and when they are used, circuit replacements arising from insulation failure can be entirely eliminated.

ROCKBESTOS A.V.C. insulation is felted and impregnated asbestos in which is embedded a high dielectric insert of varnished cambric, to give an extra margin of safety under wet conditions. Also—and this is very important—it is not just braided or wound on the conductor, but is *processed* on in a seamless, jointless, felted sheath. It is positively moisture resistant, heat proof as well as flame proof, and unaffected by fumes, oils or greases.

This basic ROCKBESTOS method—varied somewhat to meet specific requirements—has saved thousands of dollars of expense and thousands of hours of lost time which circuit failures would otherwise cause. Make your next failure the opportunity to test ROCKBESTOS wire. The type you need will be found in our catalog. Send for a copy. Rockbestos Products Corporation, New Haven, Conn.

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Detroit Chicago St. Louis

Fatal Accidents Attributed to Lack of Illumination

In a report recently issued the St. Louis Safety Council revealed a sharp increase in the number of fatal automobile accidents between dusk and dawn, the ratio of darkness fatal automobile accidents having increased from 55 per cent of the total of such fatalities in 1932 to 66 per cent in 1934. "Undoubtedly," the report stated, "reduced illumination has a decided effect on night accidents."

During 1934 the city saved $75,642 by not using 5,053 of the 42,065 electric light standards in various parts of the city, or approximately 12 per cent of such equipment. The lighting system was installed at a cost of $8,400,000. Interest on the idle equipment last year was $30,369, reducing the net saving to $45,273, without taking into consideration depreciation on equipment not used.

Mayor Dickmann and Edward E. Wall, director of utilities, declined to accept the Council's theory that lack of street illumination is responsible for the increase in automobile accident fatalities.

•

Electrical Wholesale Trade Proposes Amendment to Code

The electrical wholesale trade, a division of the wholesaling or distributing trade, through its Code Authority, has submitted a proposed amendment to the National Industrial Recovery Board for approval. The proposed amendment stipulates that it shall be an unfair trade practice for a member of the trade to grant or offer to a customer a discount for cash at a percentage greater than the percentage of discount for cash received by such member on the same merchandise; or to allow or offer to allow extra discounts for anticipated payment; or to allow or offer to allow a discount for cash on accounts remaining unpaid after the tenth of the calendar month following date of shipment; or to grant or offer to grant any discount for cash where payment is made by warrant, note or trade acceptance.

•

New Construction in 1934 Increased 23 per Cent

Construction industries in the 37 Eastern states ended the year 1934 with a contract total of $1,543,101,300 for all classes of construction, according to the F. W. Dodge Corporation. This marked a gain of approximately 23 per cent over the total for 1933. The year showed contract gains over 1933 in each of the ten general classes of construction, except factories and residential building. Public utility structures shared in the general advance, the gain being somewhat more than 20 per cent.